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Official Notice.

ANNUAL GENERAL MEETING, 1915.

In accordance with the provisions of By-law 64, notice is hereby given that the Annual General Meeting will be held in Manchester at 10.30 a.m., on Wednesday, July 14th, 1915. A programme of the proceedings will be issued later.

Under Regulation 5, all elections to the Committees and all elections of officers of Local Sections, with the exception of those to fill up unforeseen vacancies, must take place so that they can be reported to the Council in time to be considered at the meeting held under By-law 24 not less than two months prior to the Annual General Meeting (i.e., at the meeting on April 23rd).

CHARLES G. CRESSWELL,
Secretary.

Canadian Section.

Meeting held at Montreal on Tuesday, 8th December, 1914.

MR. T. H. WARDLEWORTH IN THE CHAIR.

FOREST PRODUCTS LABORATORIES OF CANADA.

BY JOHN S. BATES, PH.D.

In the list of Canada's natural resources the forest stands second, with an annual production amounting to over \$170,000,000. In recent years it has been realised, however, that the timber resources of Canada are not unlimited and that it will require careful methods of conservation to meet the permanent demand for wood, even within the borders of our own country.

The Forest Products Laboratories of Canada were established in 1913 under the jurisdiction of the Forestry Branch of the Department of the Interior. The Canadian Forestry Association, the Canadian Pulp and Paper Association, and a number of far-seeing Canadian citizens are to be credited with bringing this matter to the attention of the Government. At the same time the Forest Products Laboratories would not have been possible but for the personal interest and judgment shown by the Hon. W. J. Roche, Minister of the Interior, and Mr. R. H. Campbell, Director of Forestry. It was decided to accept the generous offer of co-operation extended by McGill University, and the laboratories have, therefore, been located in Montreal, with headquarters on the University campus. The mutual advantage of such a location will be at once recognised.

The Forestry Branch, which has been in existence since 1899, is occupied primarily with the conservation of the forests themselves and is concerned with such problems as preventing fires, re-forestation, and regulating methods of lumbering in the national forest reserves, and, in general, educating public opinion in the proper care of living trees.

The Forest Products Laboratories, on the other hand, are interested in the conservation of forest

resources by proper utilisation of the raw material. The purposes of the laboratories have already been outlined in Forestry Branch Circular No. 8. As the name of the department suggests, the greater proportion of time will be spent in the experimental investigation of wood and the many products which can be manufactured therefrom. Investigations are being undertaken with a view to extending the knowledge of wood itself, pointing out improved methods for using the raw material furnished by the Canadian forests, and finding ways and means of utilising the vast amount of waste wood which is occasioned in the lumber and allied industries. The success which has followed the efforts of the United States in their Forest Products Laboratory at Madison, and of Germany and other European countries in their various scientific laboratories, has shown the possibilities of similar work in Canada.

Through the untiring efforts of the first superintendent, Mr. A. G. McIntyre, the first units of the laboratories were organised in the latter part of 1913. On the resignation of Mr. McIntyre the writer assumed the duties of superintendent in April last, and Mr. W. B. Campbell was appointed Assistant-Superintendent. Since that time the various divisions have been more fully equipped and a good start has been made in actual experimental work. The present staff numbers twenty-three, of whom seventeen are technically trained men. Through the courtesy of McGill University two buildings at 700, University Street, have been placed at the disposal of the Forest Products Laboratories for a period of four years and these are now being altered to meet present requirements. The office and laboratory building contains about twenty rooms now in use as general offices, drafting room, chemical laboratory, photomicrographic room, library, exhibition, etc. An adjoining building is being re-constructed to serve as experimental paper-mill. The use of the University testing laboratory has been granted for the work in timber testing. A small saw-mill has been fitted up on the outskirts of the city for handling the wood specimens to be tested. A wood-working shop and machine-shop are also available.

An outline of the work in the various Divisions will give an idea of the scope of the work at present being undertaken.

For the Division of Timber Tests a Hatt-Turner impact testing machine and a 30,000-pound Olsen universal testing machine have been purchased. These are installed in the McGill University testing laboratory. Additional equipment owned by the University, including a 200,000-pound Wicksteed machine, a 150,000-pound Emery machine, and a 60,000-pound Riehle machine, are also used by the laboratories for special work. The first project in this Division is a comprehensive series of tests to establish the "mechanical and physical properties of Canadian woods, as determined by tests on small clear specimens." Testing has been in progress for several months on representative specimens of Douglas fir from British Columbia and Alberta. Other species will be tested in due course, so that the absolute and comparative strengths of Canadian woods will be established for the benefit of the wood-using industries. A second investigation now in progress is the testing of commercial pit props and booms, used in large quantities by the mining industries of Canada and now in great demand for export to Great Britain. Some three hundred sticks have already been presented by the Dominion Coal Company,

Ltd. This represents one phase of the general investigation of mine timbers being carried on by the Forestry Branch in co-operation with McGill University. A third project in view is the testing of Douglas fir and other species in the structural sizes ordinarily used.

The present equipment in the Division of Timber Physics includes microscopes, microtome, photomicrographic apparatus, balances, electric ovens, and other apparatus necessary for the determination of moisture content, specific gravity, fibre characteristics, and other physical properties of wood. The present scope of this division is limited largely to a study of the physical nature of specimens handled in the Division of Timber Tests. It is hoped to extend the work to include wood seasoning and the many important branches of wood technology.

Special stress is being laid on facilities for study in the field of pulp and paper. To this end a separate building is being equipped to allow the carrying on of pulp and paper-making processes on a semi-commercial scale. The equipment, which will be installed in the near future, includes a very complete Fourdrinier paper-machine, which is the largest experimental paper-machine ever constructed, single and double beaters with interchangeable basalt lava and steel rolls, small Jordan engine, stuff chests, screens, paper-testing instruments, etc. These will be followed by sulphite and sulphate digesters, bleaching apparatus, and such other equipment as is necessary to conduct experiments in a thoroughly practical manner.

It is very encouraging to find that the pulp and paper industry is taking a keen interest in this development, and valuable gifts have been presented by various companies. One of the first investigations will be a study of the beating of paper pulp, which will include a comparison of steel and stone rolls.

A Division of Wood Preservation has recently been organised. Although it will be impossible to do extended laboratory work while we are limited to present quarters, arrangements are being made to carry on field tests which should prove of great value. Studies will be made of methods of treating railway sleepers, telephone poles, mine timbers, wood paving blocks, etc., and records will be kept of the life of treated and untreated timbers under varying conditions. A fungus pit is being installed in the laboratories to allow accelerated tests. The larger Canadian railroads have already expressed their keen interest in our present investigation of sleepers, and we are assured of their co-operation.

The Division of Chemistry is one which bids fair to solve many pressing problems. The laboratories have already been called upon to report on the recovery of potash from wood ashes. In addition to the chemical work which is closely interwoven with the mechanical and physical tests, it is important to develop research along strictly chemical lines. To overcome the present deficiency in facilities and staff an attempt is being made to encourage and assist chemical research on forest products in various Canadian universities. Queen's University has recently undertaken a chemical study of waste sulphite liquor.

A number of other divisions will be started when conditions permit. For the present a general study is being made of wood distillation, hydrolysis of wood, and allied subjects. In connection with proposed Canadian developments in wood distillation, the author was present at a series of commercial distillation tests on British Columbia Western Yellow Pine in North Carolina last August. Mere mention of such problems as utilisation of sawdust, bark, treetops, and stumps is sufficient to show the importance and difficulty of the work before us.

Books, bulletins, journals, pamphlets, and other literature on the subject of wood and its products are being collected as the nucleus of a comprehensive library for the benefit of the workers in the laboratories and of the public at large.

Arrangements are being made to collect a complete series of wood specimens from all parts of Canada to be exhibited in the laboratories. In addition to these, representative samples of manufactured wood articles, pulp and paper, wood flour, composition board, artificial silk, paper yarn, and the many other products which can be made from wood will be collected for exhibition and reference purposes. In this way a valuable exhibit of forest products will be available to stimulate the public in conserving and developing our great natural resources.

Two publications have already appeared as contributions from the Forest Products Laboratories, the first being Forestry Branch Circular No. 8, entitled "Forest Products Laboratories," and the second, Forestry Branch Circular No. 9, "Chemical Methods for Utilising Wood Wastes." A third bulletin on the subject of "Treated Wood Block Paving" will soon be ready for distribution. An announcement of the work in timber testing is also being prepared for publication.

In addition to experimental work, the laboratories are serving to the best of their ability as a public bureau of information on the subject of forest products.

To insure the success of the laboratories in helping to solve the problems of greatest and most immediate importance which are confronting the wood-using industries, special steps have been taken to keep in touch with the industries and with the work of other Government bureaus, universities, and scientific societies. To this end members of the staff visit various industrial plants, scientific institutions, and so forth from time to time, and attend the meetings of organisations interested in furthering the use and conservation of wood.

The laboratories are especially fortunate in having an Advisory Committee composed of gentlemen keenly interested in the welfare of our Canadian forests and possessing a wide, practical knowledge. The personnel of the board is as follows: Dr. Frank D. Adams (Dean of the Faculty of Applied Science, McGill University), Dr. R. F. Ruffan (Director, Department of Chemistry), H. M. Mackay (Professor of Civil Engineering), P. Howard Wilson (President, J. C. Wilson), Carl Riordon (Managing Director, Riordon Pulp and Paper Co., Ltd.), Judson A. DeCew (President, Process Engineers Ltd.), R. O. Swezey (General Manager, Montreal Engineering Co., Ltd.).

This outline is presented not so much to show what is now being accomplished as to indicate the possibilities which the future holds forth. The Forest Products Laboratories have begun in a small way. To meet the large needs of this growing country, the work of the laboratories must expand. The proving of their worth in public service will surely lead to a permanent home in a new and fully equipped building. It is to scientific and technical societies and to the universities and industries throughout the country that we must appeal for co-operation in making our work of real value.

One of the most forceful lessons of the present war is the startling realisation that Canada is woefully dependent on other countries, in spite of unparalleled natural resources. The Hon. W. T. White, Minister of Finance, said this week: "It is the duty of all Canadian citizens to co-operate in producing as much as possible of what can be used or sold. For Canada at this juncture the watchword of the hour should be production, production, and again production."

But can lasting results be obtained without the aid of scientific methods? And would it not be wise to change our motto "Made in Canada" to "Made Well in Canada"? It is the aim of the Forest Products Laboratories to lend practical assistance in attaining this end.

PRESERVATIVE TREATMENT OF WOOD.

BY W. D. CAMPBELL, B.Sc.

Possibly the first recorded attempt to increase the durability of wood was in the case of the famous wooden statue of Diana of the Ephesians, in which numerous holes were bored into which the priests were expected to pour oil from time to time to prevent rot. Since that time a large amount of work has been done with the same object in view. In the last ten or fifteen years hundreds of different processes and preservatives have been suggested, and though most of these have proved of no value in themselves, they have all helped to shed light on the subject.

The decay of wood is caused by certain forms of fungus which feed on the various portions of the wood substance. There are many varieties of these fungi and they act in many different ways; their requirements in the main are food, air, heat, and moisture. The food of the fungus consists of the cell contents and the cell walls. Different fungi attack different parts; some feed mostly on the cellulose, others on the lignin. Nearly all feed on the cell contents and some of them attack all portions of the wood. The cells of the sap-wood contain protoplasm which is very easily attacked by the fungus, and accordingly the sap-wood is the first to show its destructive effects. It is for this reason that engineering specifications frequently exclude sap-wood in structural timber. If wood be immersed in water or in clay so that all or nearly all the air is excluded, it will last indefinitely. There are also certain heat limits outside which either the fungus is killed or its growth is so retarded that it has very little effect on the wood. The water supply is also a very important matter to the fungus; if the wood is kept very wet the air supply is cut off and the fungus does not increase. On the other hand, if the wood is kept very dry, as, for instance, wood exposed indoors to ordinary dry air, the moisture content drops to below 10%, and the fungus ceases to grow. Of the four requisites of fungus only two are, to any extent, under control, namely, food and water. The water content can be reduced by air-drying or by kiln-drying, but as a method of preserving wood this is of no value, since the timber readily absorbs moisture from air. The other alternative is the food supply; by poisoning this the growth of fungi can be entirely prevented. The method is usually employed by injecting into the wood substances which are sufficiently toxic to kill the fungi or retard their growth, both by the toxicity and by excluding air and moisture.

Before applying the preservative to the wood, some preliminary treatment, such as seasoning, is found advantageous. In the majority of cases simple air seasoning is adopted: the wood is piled so as to be freely exposed to the air but protected as much as possible from rain, etc., until it has lost the greater part of its moisture and has come to a condition approaching "air-dry." Green timber contains 40 to 60% of water; "air-dry," about 10 or 12%. Air-drying seems, at first sight, a very simple operation, but there are some difficulties. A long time is necessary to dry large-sized timbers, there is considerable risk of fire, and the timber may be partially destroyed by fungoid growth before the treatment is started. The drying may be hastened by the use of a kiln, but this is not considered practicable where large

timbers are to be handled. Steaming under light pressure, followed by a vacuum, is also used, but in most cases is not considered satisfactory, and there is also danger that the steaming may impair the strength of the wood. In one creosoting process the green wood is submerged in a bath of creosote, heated above 100° C., whereby the water is driven off as steam and replaced by creosote. With this process there is also the possibility of over-heating with consequent loss of strength. Many combined treatments are considered more suitable for certain woods.

The preservatives used are of great variety, but fall naturally into two classes—those soluble in water and those of an oily nature immiscible with water. The chief representatives of these classes are respectively zinc chloride and creosote oil or dead oil of tar. Others of the first class are mercuric chloride, sodium fluoride, and copper sulphate. The only other representative of the second class is crude petroleum, which is used only to a very slight extent.

As the preservatives used are always in greater amount than is necessary to prevent fungoid growth, the aim of the various methods of application is to secure as great a depth of penetration as possible at the lowest possible cost. Dipping or brush treatments are the cheapest methods; pressure treatments are more effective but more costly. Salts in aqueous solution penetrate wood with comparative ease, so that they are frequently applied by the bath method. This was the original way of applying these salts, and it is still frequently used where zinc chloride is being applied and I believe always with mercuric chloride. Open baths and brush applications are also used with creosote where a heavy treatment is not necessary or where, as in the case of telephone poles, it is not necessary to treat the whole pole. But the better penetration obtained in pressure processes and the shorter time necessary for the treatment has led to their adoption in most plants.

Creosote is usually applied by one of the pressure processes. The original aim was to get as much oil as possible into the wood: to do this creosote was applied to the timber in an evacuated chamber, and then pressure was applied to drive the creosote into the wood. This process caused the creosote to saturate the cell walls and to fill the cell cavities. Later investigation showed that the oil in the cavities was not doing any work, and various processes were developed to saturate the walls without leaving any oil in the cavities. These are known as "empty cell" processes. One method of accomplishing this is as follows:—Instead of an initial vacuum, an initial air pressure of about 50 lb. is applied and then the creosote is forced in against this, using a total pressure of about 200 lb.; when the wood has absorbed rather more than the specified quantity of oil per cubic foot, the excess is drained off and the pressure allowed to fall to atmospheric. The compressed air inside the wood then expels some of the creosote from the cells but does not remove that which has been absorbed by the walls. In another process no initial pressure or vacuum is used but a final vacuum is applied to draw off the excess. This, it is claimed, gives a cleaner surface than the other methods.

The comparative efficiency of the different preservatives depends upon the use to which the wood is to be put and is entirely a matter of balancing the additional cost against the desired additional life. Soluble salts do not give as long a life as creosote in wet places, since they are liable to be dissolved, but this solution is not nearly so great as might seem at first sight, since the cell material is all colloidal and the salts are held very tenaciously. The advocates of mercuric chloride claim that the salt is held so closely by the wood

that there is no danger of poisoning. Whether this is the fact or not is uncertain. The U.S. Government authorities are inclined to discourage the use of mercury on account of this danger. A case is cited of a number of cows which died after licking the sleepers on a railroad using this process; on the other hand it is stated that these particular ties were treated with zinc chloride.

The creosote oil used is a coal-tar fraction having a specific gravity of about 1.09 at 20° C., distilling between 210° C. and 355° C. This is frequently diluted with heavier tar for purposes of economy, but even when so diluted, the toxicity is sufficiently high. The tar used should contain only a small quantity of free carbon, otherwise this may separate and remain in the outer layers of the wood, making a very dirty material. The lighter fractions of the oil are most toxic but in the course of time they evaporate, leaving only the heavier constituents. It seems, therefore, that the mixture as found in the oil is more efficient than either of the fractions separately, since the heavy constituents will not readily penetrate the wood alone, and greater toxicity is needed at the beginning in order to destroy growths already started.

One of the largest uses for treated wood is for railroad sleepers. In Canada in 1910 9,000,000 sleepers were used; in 1911, 14,000,000; in 1912, 21,000,000. A great many of these were for construction, but more than half were for renewals. There are approximately 100,000,000 railway sleepers laid in Canada at present, costing the railroads 12 to 15 c. a year each for maintenance. Experience elsewhere has shown savings of 1 to 5 c. a year per sleeper, due to preservative treatment. At a saving of 1 c. per sleeper this represents a total saving of \$1,000,000 per year. The woods used at present are Jack pine, cedar, Douglas fir, hemlock, tamarack, and western larch. All of these—except cedar—rot easily and last only from four to seven years; all are soft and the mechanical wear is very great. They are becoming scarce and frequently have to be hauled over considerable distances. There are within reasonable distance considerable uncut forests of beech, birch, maple, and other hardwoods, which are much more resistant to wear when sound, but decay very rapidly. By preservative treatment the decay is prevented and they can be made to outlast any of the soft woods.

Creosoted wood is also coming into extensive use for street paving in the more progressive cities. By making a pavement of creosoted wood blocks, laid on a concrete foundation, with a minimum of sand cushion between, it has been found possible to have a street which combines to an almost ideal extent all the desirable properties of ease of cleaning, low ultimate cost, freedom from dust and noise, and ease of haulage.

London Section.

Meeting held at Burlington House on Monday, March 1st, 1915.

PROF. W. R. HODGKINSON IN THE CHAIR.

There was a further series of exhibits of chemicals and apparatus which hitherto have mainly been produced abroad but now are being manufactured in this country (see also this J., 1915, 126). The following is a list of the exhibitors and products:—
The British Aluminium Co., Ltd. Aluminium powder, granulated aluminium, pure aluminium hydroxide.

Messrs. A. Boake Roberts & Co., Ltd. (Stratford). Cineol, cœnanthic ether, &c

Messrs. Burroughs, Wellcome and Co. (Dartford) Atropine, cocaine, eserine, homatropine, hyosine, and pilocarpine salts; kharsivan and neokharsivan (salvarsan and neo-salvarsan), &c.

Messrs. W. J. Bush & Co. Ltd. (Hackney). Salicylic acid, soda salicylate, aceto-salicylic acid, vanillin, benzylidene acetone, diphenylmethane, &c.

Messrs. Fuerst Bros. (17, Philpot Lane, E.C.). English acid-proof stoneware, tower-filling and pipes.

Kestner Evaporator and Engineering Co. Ltd. Homogeneous coating of lead on mild steel, wrought iron, and gun metal.

Silvertown Lubricants, Ltd. Pure medicinal liquid paraffin.

Thermit Ltd. Pure carbon-free manganese and chromium metal; aluminio-thermic welding compound.

Dr. J. T. Hewitt, F.R.S., on behalf of a firm of chemical manufacturers in the London district, whose name is not published. Phenylhydrazine hydrochloride, pure and commercial.

After a brief description of the various exhibits had been given,

Sir WILLIAM RAMSAY, referring to possible German competition after the war was over, said that the French Société d'Encouragement pour l'Industrie Nationale were seriously debating, and the French Government seriously thinking of excluding every German product from France, of preventing any German from manufacturing anything in France, and of buying up all German industries at present existing in France. The Russian Government thought of pursuing the same policy.

PRODUCTION OF NITRATES FROM THE AIR, WITH SPECIAL REFERENCE TO A NEW ELECTRIC FURNACE

With reference to the concluding paragraph in the discussion on the above paper by Mr. E. Kilburn Scott (this J., Feb. 15th, 1915, p. 126) as to the Ostwald patents for the catalytic manufacture of nitric acid, Mr. H. B. Weeks writes as follows:—

"In the course of Mr. Barton's address to the Shareholders at the Annual Meeting of the Nitrate Products and Carbide Co. Ltd., he stated that 'the efficiency of the plant at Vilvorde fell so low as to cause the Directors grave anxiety,' but he also stated (which Mr. Kilburn Scott has omitted to state) 'that not only had the cause of the fall in efficiency been ascertained, but that in investigating that cause they had been enabled to so modify and improve the plant that the efficiency eventually obtained was actually 12½% in excess of that on which the original estimate of profits was based, and that this extra 12½% efficiency had been obtained without any addition to the working costs.'"

Scottish Section.

Meeting held at Glasgow, on Tuesday, November 24th, 1914.

MR. ROBERT HAMILTON IN THE CHAIR.

THE CORROSION OF NON-FERROUS ALLOYS.

BY CECIL H. DESCH, D.SC., PH.D.

The method usually employed to determine the relative corrodibility of metals and alloys consists in exposing specimens of the materials to be

compared to the action of a corrosive agent for a sufficient time, and determining the loss of weight in each case. The corrosive agent may be that to which the material is intended to be exposed during actual use, such as atmospheric air, fresh or salt water, sewage, or industrial liquors, or it may be an artificial solution, selected with the object of accelerating the test. In the latter case an external electromotive force is sometimes applied.

It is difficult to obtain accurate information in this way. The test of exposure to actual working conditions is so slow as frequently to be impracticable, whilst most forms of accelerated test fail to indicate in any satisfactory way the power of resistance to corrosion in actual practice. For example, the relative order of resistance of different specimens of steel when exposed to atmospheric influences is by no means identical with that of the resistance to attack by dilute sulphuric acid, and a determination of the loss of weight under the latter conditions is valueless, and is generally recognised as being so, when it is desired to compare steels with a view to their use in external work. A similar statement may be made in regard to the non-ferrous metals and alloys.

Another form of test consists in determining the electromotive force which is developed when the specimen of metal under examination is connected with a standard metal, and immersed in a suitable electrolyte. It has been assumed that an arrangement of different metals in an electro-chemical series in this way will indicate the relative order of resistance to corrosion, all corrosion being regarded as electrolytic in character. This test has proved valueless in practice. The effects of polarisation are so complex that it is almost impossible to obtain comparable results with different specimens, the values of the electromotive force varying greatly with time, whilst even the values obtained when some kind of equilibrium appears to have been reached bear little or no relation to the properties observed in practice.

The principal defect of laboratory tests of corrosion, and especially of accelerated tests, is their neglect to take into account the mechanical factors which influence the process. A specimen of metal is immersed in a solution or exposed to the atmosphere. After a sufficient length of time, the specimen is withdrawn, washed, and then brushed or scraped until an apparently clean surface of metal is again exposed. The loss of weight is then regarded as representing the amount of corrosion. This determination is sometimes supplemented by an analysis of the "corrosion product," under which are included the salts dissolved by the liquid, the flocculent precipitate of basic salts which is formed when the electrolyte is neutral, and any adherent crust, either of oxide or of metal. Moreover, when the alloy is made up of two different kinds of crystals, exfoliation is sometimes observed, and the crystals which are thus dislodged also find their way into the "corrosion product." An analysis of such a heterogeneous mixture throws little light on the process of corrosion.

Observation of corrosion under industrial conditions makes it evident that the mechanical properties of the substances formed during the process exercise an important influence on its velocity. For example, iron corrodes much more rapidly in ordinary moist air than either zinc or aluminium, a fact which would not be inferred from the relative positions of the three metals in the electro-chemical series, or from their behaviour when immersed in dilute acids. The difference is due to the fact that iron forms a porous rust, which admits the passage of gases and

of condensed moisture, thus facilitating further corrosion, whilst both zinc and aluminium form a tough, adherent layer of basic salts, which serves as a protective varnish and, even when quite thin, hinders any further action of the corrosive substances. This factor, which is left out of consideration in ordinary accelerated tests, and even in prolonged tests in which only the loss of weight is determined, is of the highest importance.

The influence of tin on the corrosion of brass may be taken in illustration. It has long been known, from practical experience, that the resistance of brass to corrosion by sea-water is greatly increased by the presence of a small quantity of tin in the alloy, and the standard Admiralty alloy for condenser tubes consists of 70% Cu, 29% Zn, and 1% Sn. The effect of tin cannot be accounted for on electro-chemical grounds, as the effect on the solution-pressure of the zinc must be very small. Experiments by the method described below, however, prove that the influence of the tin is largely, perhaps entirely, mechanical. Corrosion begins in the usual way, at a rate differing little from that of a similar alloy containing no tin. In the presence of a neutral electrolyte, a part of the dissolved metals is precipitated in the form of a basic salt. Copper and zinc are converted into loose, flocculent precipitates, which are readily detached from the surface of the metal by even the lightest washings with water. The tin, on the other hand, although present in such small quantity, forms a tough, adherent layer which, even when very thin, has the properties of an impervious varnish, and can only be detached from the surface with difficulty. Lead, which also exerts a protective influence on brass, acts in a similar manner, but it is found that a larger proportion of lead is necessary in order to produce a favourable effect, a small addition being sufficient to render the layer of basic salt compact. Iron, on the other hand, is quite without protective influence on brass, and indeed accelerates the process of corrosion.

The elaborate experiments with full-sized condenser tubes, conducted by Dr. Bengough for the Corrosion Committee of the Institute of Metals, have shown the importance of solid deposits in affecting the nature and extent of the corrosion of brass by sea water.* The influence of solid particles of coke or other foreign matter in contact with the metal is still under discussion, but appears to be considerable.†

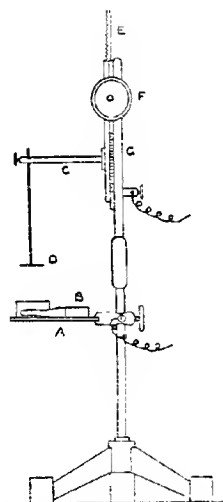
It has seemed worth while to devise a method of testing metals in regard to their power of resisting corrosion which should be rapid, applicable to small specimens, and suitable for the investigation of the influence of adherent films, alluded to above. In the case of alloys composed of two or more micrographic constituents, it was also thought desirable to observe the relative rate of corrosion of those constituents. For this purpose it was decided to use specimens of the size usually adopted for metallographic examination, having a polished surface suitable for direct observation by means of the microscope. Further, it was thought advisable to assist and regulate the corrosion by the application of an external electromotive force. Objections have been urged against such a procedure, on the ground that chemical and electrolytic corrosion are different in character, but the experiments with condenser tubes, alluded to below, have clearly shown that the mechanism of the two processes is identical, whilst the conditions of a rapid laboratory test cannot be fulfilled without the aid of an applied electromotive force.

* Journ. Inst. Metals, 1911, 5, 28; 1913, 10, 13 (see this J., 1911, 219; 1913, 913).

† A. Philip, *ibid.*, 1914, 12, 133, and discussion (this J., 1914, 923).

The method adopted in a series of experiments with Mr. S. Whyte* consisted in supporting a small platinum cathode 1 cm. above the horizontal polished surface of the specimen by means of a Classen stand for electrolytic analysis. A containing cell was built up of plasticine, and the electrolyte was then introduced by means of a pipette. The external electromotive force was supplied by two dry cells.

The method has now been improved in detail, and a special apparatus, of the form shown in the figure, is now used. The vertical brass rod of the stand is divided into two parts, insulated from one another by a short section of ebonite. The lower rod carries a brass plate, A, which may be clamped at any height. The small brass block, B, carries a pair of spring clips between which the specimen, 12.5 mm. square, is held with the polished



horizontal surface upwards. The cathode is a piece of fine platinum gauze, D, 10 mm. square, firmly attached to a vertical wire which passes through a hole in the arm, C, and is held by a screw. This arm is attached to a sliding plate, which may be raised and lowered by a rack, E, and pinion, F. A scale, G, allows the height to be adjusted. The specimen, which has been prepared as if for microscopical examination, is carefully freed from grease and placed in position. The cathode is lowered until in contact with the specimen and then raised 5 mm. A wall of plasticine is built up to contain the electrolyte, which is usually 1 or 2 c.c. of a 5% solution of sodium chloride. The two binding screws are connected with the source of current, which is most conveniently a storage battery provided with a distributing board and measuring instruments for electrolytic analysis. Corrosion is then allowed to proceed for 5, 10, 20, or 60 minutes, according to circumstances. The wires are disconnected, and the electrolyte is rinsed out of the plasticine cell into a beaker, using a wash-bottle with a fine jet. A loose, flocculent precipitate is usually obtained. Any solid deposit adhering to the corroded surface so loosely that it is detached by light rubbing with the finger tip, may usually be added to the bulk, but a firmly adherent deposit,

requiring the use of a wooden chisel-edge or a knife-blade to detach it, should be collected, if present, for separate analysis.

The surface of the corroded metal is examined under the microscope both before and after the removal of the adherent layer. The texture of the latter is thus observed, as well as the nature of the attack on the metal, and the comparative behaviour of different micrographic constituents, when such are present in an alloy. The analysis of the products of corrosion is performed as far as possible by colorimetric methods, on account of the very small quantity of each element to be estimated, amounting in many cases only to a fraction of a milligram. It has been found possible to estimate the proportions of copper, zinc, iron, tin, and lead with a satisfactory degree of accuracy, and there will probably be no difficulty in estimating other metals in a similar manner.

A useful test may often be made by employing a much larger quantity of solution, such as 100 c.c. For this purpose the apparatus is arranged as above, but the wall of plasticine is built up somewhat higher, and provided with a lip at one corner by which the liquid may overflow into a receiving vessel. The solution of electrolyte is allowed to drop into the corrosion cell from the jet of a burette, the tap of which has been previously adjusted so that the total quantity escapes in a fixed time, such as an hour. In this case, the flocculent precipitate of basic salts does not settle, but is continually carried over into the receiving vessel, and the surface of the metal remains clean, except when an adherent layer is formed. This method is therefore a convenient one for determining whether such a protective layer is formed or not during the corrosion of a given alloy.

Experiments on the corrosion of brasses of different composition have led to the following conclusions:—

1. Corrosion of brasses takes place by dezincification. Both copper and zinc are removed in solution, but the ratio of zinc to copper in the solution and the flocculent precipitate is much higher than in the alloy.
2. The β -alloys are much more readily attacked than the α -alloys, and the preferential removal of zinc is much more strongly marked in alloys of the former class.
3. In alloys containing both the α and the β constituent, the latter is almost completely corroded before the former is attacked. (The corrosion of this class of alloys is now being investigated by Mr. Whyte.)
4. A layer of metal is left below the corroded surface, containing much less zinc than the original alloy, and having an open, spongy texture. In the case of β -alloys, this layer may contain as much as 99.6% Cu. It is sharply defined in depth, that is to say, a gradual transition from unaltered to completely dezincified brass is not observed. This is true of α as well as of β -alloys.
5. The spongy layer readily oxidises under the influence of atmospheric or dissolved oxygen. The layer of cuprous oxide which is often observed on the corroded surface of brass tubes, is doubtless of secondary origin, the original process having been one of dezincification.
6. The removal of zinc proceeds at first along the boundaries of crystal grains, and, in the case of α -brasses, which commonly exhibit twinning, along the dividing planes between twin crystals. Well-defined etch-figures are frequently seen on the surface of both kinds of brasses after removal of the coppery layer.

* Journ. Inst. Metals, 1913, 10, 304; 1914, 11, 235. Journ. West of Scotland Iron and Steel Inst., 1914, 21, 176 (see this J., 1914, 358).

7. The presence of iron in solid solution accelerates corrosion, whilst that of tin checks it after the process has continued for a very short time. This check is not due to electro-chemical causes, but to the mechanical protection afforded by a tough, adherent layer of basic salts, containing tin. Lead in small quantities is without protective effect, but with 2% Pb (in the case of an α -brass) a protective layer of basic salts is formed, and corrosion is greatly retarded, in spite of the fact that distinct dezincification is observed at first around the globules of lead in the alloy.

8. The process of corrosion by sea and other natural waters is of essentially the same character as that of electrolytically stimulated corrosion under the conditions described above. This conclusion has been confirmed by the comparison of laboratory specimens with portions cut from tubes and plates which have become corroded during actual use. For example, a condenser tube which had undergone extensive corrosion by Manchester Ship Canal water was examined. The original brass had contained Cu 72.72%, Zn 27.04%, Fe 0.15%, and Pb 0.09%. Along the bottom of the tube a band of metal had been almost completely dezincified, whilst at a somewhat higher level the layer of spongy copper extended only partly through the thickness. Microscopical examination showed that the boundary between copper and unaltered brass was everywhere perfectly sharp, without any intermediate layer of partly dezincified alloy. Moreover, the removal of zinc was found to have proceeded by way of crystal boundaries and twinning planes before penetrating into the interior of the crystal grains.

The same effects could be reproduced in their smallest details by means of electrically-stimulated corrosion in the laboratory. A sound, uncorroded section of the same condenser tube was converted into a cell by closing the lower end with plasticine. The tube, filled with sodium chloride solution, was connected so as to become the anode, a coiled platinum wire, placed centrally, serving as cathode. After the current had passed for 24 hours, the section of tube was dried, sawn through, and examined microscopically. The same features were observed, a completely dezincified layer, in which the brass was now represented by spongy copper, separated sharply from unaltered brass, the dividing line running along boundaries of crystal grains and twin lamellae. Similar results have been obtained with other corroded objects.

When making an examination of a corroded tube, it is necessary to fill the tube with fusible metal before cutting and grinding, in order to preserve the sharpness of the edges, and to prevent the dislodgement of fragments of brittle copper.

Recently, the application of this method has been extended by the author and Mr. H. Hyman to the bronzes or gun metals, the experimental details being exactly as described above. The ordinary gun metals, including the well-known Admiralty alloy, are composed of the α -solid solution, together with smaller masses of the α -eutectoid. It is found that either the α - or the β -constituent may be attacked the more rapidly, according to the difference of electrolytic potential employed. Thus, by varying the electromotive force applied in the corrosion test, the etching effect may be reversed. There is in this case no process quite similar to dezincification, and the formation of a layer of metallic copper is not observed. It is found, however, that the layer of basic salts may be either loose or coherent, according to the conditions of the test.

and that in the latter case corrosion may be arrested or checked after a certain amount of action has taken place.

Obituary.

EUSTACE CAREY.

Eustace Carey was born on March 12th, 1835, and was educated at University College School, London, and at the Royal School of Mines. In the year 1857, he went to Widnes as chemist in the works of Messrs. Gaskell, Deacon and Co., and in 1871 became a partner. On the formation of the United Alkali Company in 1890, in which Messrs. Gaskell, Deacon and Co. was merged, he became Secretary, retaining that position until January, 1914, when ill-health compelled him to retire. The credit of having rescued the Leblanc soda process from the danger of annihilation belongs chiefly to Eustace Carey, with the late Henry Deacon and the late Dr. Ferdinand Hurter, who introduced improved methods, especially as regards the production of chlorine and its utilisation in the manufacture of bleaching powder and liquor, and chlorates. He was one of the founders of this Society, and it was he who, at the meeting in Manchester on April 19th, 1880, proposed the appointment of a committee to consider the formation of a Society for the promotion of the application of chemical science to manufactures; he was a member of the first Publication Committee, with Ludwig Mond, John Spiller, Thomas Tyrer, G. E. Davis (Hon. General Sec.), and H. E. Roscoe (President), and continued to serve on that Committee until July, 1885. He was Hon. Northern Secretary until July, 1883, when both this office and that of Metropolitan Secretary were abolished. He was Chairman of the Liverpool Section from 1893 to 1894 and again from 1904 to 1906; he also served on the Council as an Ordinary Member from 1883 to 1885, 1886—1888, and 1900—1903, and as Vice-President from 1903—1906 and 1907—1910, being elected President in 1906. He was again elected to the Council in 1913, and remained a member until his death.

He was the author of several important and suggestive communications to this Society, including his Presidential Address on "Technical Training and Manufacturing Methods" (Birmingham), (this J., 1907, 791—797); "Some Remarks on the Working of the Employers' Liability Act, 1880" (this J., 1883, 152—153); "The Organisation and Management of a Chemical Works" (this J., 1893, 901—906); "The Invasion of the Inventor" (this J., 1894, 1024—1026); "Chemical Industries in the United States" (this J., 1905, 3); "Some Observations on the Alkali Works Regulation Bill" (this J., 1902, 211); "Exports of Heavy Chemicals" (this J., 1896, 322); "Factory and Workshops Act" (this J., 1902, 211); "Firing with Coal-dust" (this J., 1905, 369).

Mr. Carey died at his residence, Grassendale Park, Liverpool, on March 3rd.

Journal and Patent Literature.

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I.—GENERAL PLANT; MACHINERY.

Corrosion of boiler tubes. Tätigkeitsber. des Kgl. Materialprüfungsamtes zu Berlin-Lichterfelde für das Jahr 1913/14. Chem.-Zeit., 1915. 39, 71.

MANY cases of local corrosion of boiler tubes were found to be due to the liberation of oxygen bubbles from the feed water: these adhere to the walls of the tube causing oxidation, and the oxygen from fresh feed water is then liberated preferentially on the parts roughened by oxidation, thus accelerating the local corrosion.—T. C.

PATENTS.

Drying machines. J. McL. Cameron, London. Eng. Pat. 10,467, Nov. 3, 1913.

A VERTICAL cylindrical casing is divided into compartments by horizontal partitions having central apertures for the passage of a vertical shaft, and one or more radial apertures for the passage of the material downwards. Movable partitions, supported from and rotated by the shaft and also provided with one or more radial apertures, are arranged between the fixed partitions. Agitators are suspended from the lower side of each partition in such a way that they agitate the material during part of the rotation only. A distributing device is provided at the top of the casing and the heated air or gas is admitted at several levels.—W. H. C.

Dryer: Centrifugal—. F. B. Anderson. Assignor to C. O. and A. D. Anderson, Cleveland, Ohio. U.S. Pat. 1,122,460, Dec. 29, 1914. Date of appl., Sept. 25, 1911.

THE material to be dried is fed through the hopper, 18, and is deflected by means of the devices, 20, 20, against the inner surface of the upper part of the

the perforations into the casing, 2, and is discharged through the shoot, 6, and the solid matter gradually travels down the inner surface of the drum till it is stopped by the inwardly projecting flange, 21, from which it is removed by the scraper, 24.—W. H. C.

Drying apparatus: Centrifugal—. C. W. Howard, Fort Madison, Iowa. U.S. Pat. 1,123,536, Jan. 5, 1915. Date of appl., Jan. 17, 1914.

SEVERAL drying cylinders, each revolving on its own axis, are mounted upon a horizontal frame so that they can be rotated around its central axis. During part of the rotation around the axis of the frame the motion of the cylinders around their own axes is arrested to allow the solid matter to be discharged. Means are provided to fill the cylinders and to collect the separated liquid whilst they are being rotated.—W. H. C.

Dryer: Rotary—. W. E. Prindle, Manitowoc, Wis. U.S. Pat. 1,123,077, Jan. 26, 1915. Date of appl., Aug. 6, 1913.

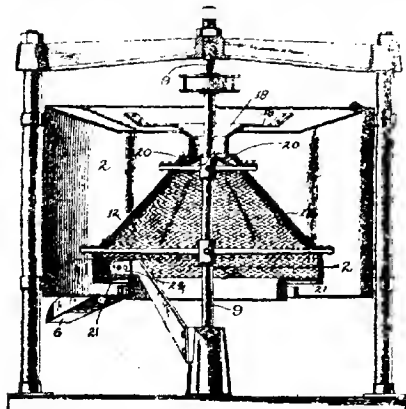
A ROTARY drying cylinder is divided into a number of segmental compartments by radial partitions, which do not extend to the axis, thus leaving a central passage, into which the compartments open. At one end the cylinder is provided with a feeding device and connected with a furnace to supply hot gases, whilst at the other end it communicates with an expansion chamber, provided with baffles and with an outlet for the dried material and connected with a fan, which draws the hot gases through the dryer.—W. H. C.

Drying machine: Automatically-acting horizontal—. T. Suzuki, Tokyo, Japan. U.S. Pat. 1,126,587, Jan. 26, 1915. Date of appl., Sept. 2, 1913.

A CYLINDRICAL drying chamber is connected with an air-supply chamber at one end and an exhaust chamber at the other. A rotary stirring member comprising a number of spaced bars, carrying scoops arranged spirally, is mounted in the drying chamber, and fingers projecting from the bars engage with a valve in the bottom of a feed hopper carried by the drying chamber, so as to cause intermittent flow of the material from the hopper into the drying chamber. The drying chamber is heated by a furnace beneath it, and air heated in a conduit passing through the furnace is led to the air supply chamber and drawn through the drying chamber by a fan in the exhaust chamber.—B. N.

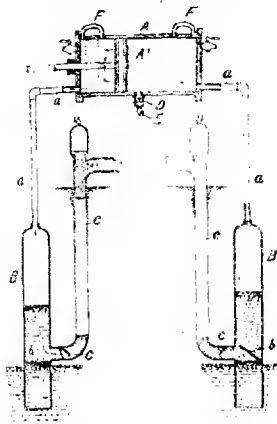
Raising or forcing water and other liquids: Apparatus for—. F. O. de Hymel, M. C. Shiner, J. T. Rives, and A. L. Mallock, San Antonio, Tex., U.S.A. Eng. Pat. 23,476, Oct. 16, 1913.

THE pump consists of two chambers, B, which dip into the liquid and are provided with inlet flap-valves, b, and with non-return, delivery flap valves, c, in the rising mains, C. The chambers are connected above by pipes, a, with the opposite ends of



perforated, conical drum, 12, which is rotated about the shaft, 9. The liquid passes through

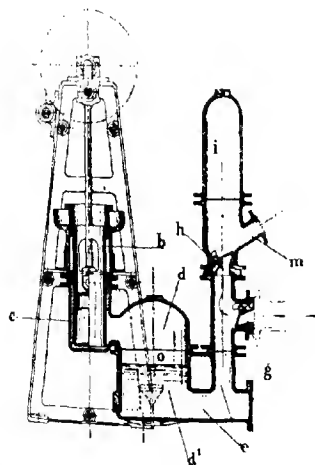
the air cylinder, A. As the piston, A', which is connected to a suitable driving mechanism, reciprocates, a vacuum is produced in one of the



chambers, B, whereby water is drawn in, whilst pressure is produced in the other chamber, forcing the water into the rising main. When the piston approaches the end of the stroke, the pressure on each side of it is equalised by the by-passes, F, F. A regulated quantity of air is allowed to enter the cylinder through the cock, E, and the valve, D, to replace loss.—W. H. C.

Pump for corrosive liquids. A. Ferraris, Turin, Italy. Eng. Pat. 4482, Feb. 20, 1911.

THE pump consists of a cylinder, c, a piston, b, an intermediate chamber, d, d', and a valve chamber, e. The cylinder and the upper part of



the intermediate chamber contain an inert liquid, e.g., vaseline oil, to serve as a medium for transmitting the action of the plunger to the corrosive liquid, which fills the valve chamber and the lower part of the intermediate chamber up to the level, o. The corrosive liquid enters through the valve, g, is forced into the air chamber, i, through the valve, h, and is discharged through the rising

main connected at m. Those parts of the pump that come in contact with the corrosive liquid are made of suitable resistant materials.—W. H. C.

Separation of solid substances from liquids; Method of and means for the centrifugal. — J. Hughes, London, W. O. Travis, Hampton, Middlesex, and R. A. Sturgeon, Llangollen, N. Wales. Eng. Pat. 24,038, Oct. 23, 1913.

THE pressure produced in liquids when subjected to centrifugal force is utilised to consolidate and eject the separated solid matter. The drum of the centrifugal machine is provided with a piston, which can move axially with respect to the drum. On starting the machine the pressure of the liquid fed into the drum, causes the piston to move downwards and leave a space for the liquid. The solid matter collects on the inner side of the drum, and the liquid is discharged through openings in the cover. When sufficient solid matter has accumulated, the supply of liquid is cut off and liquid is admitted below the piston. This causes the piston to move towards the cover and compress and consolidate the solids. Finally the cover, which is normally kept closed by centrifugal weights, is lifted slightly by projections on the piston, and the solids are ejected between the upper edge of the drum and the cover. The liquid below the piston is then discharged and the process repeated. The joint between the piston and the drum is made by a split ring. The liquid admitted below the piston may be the same as that being treated, in which case the machine is double acting. In an alternative form the drum is movable axially and the piston fixed.—W. H. C.

Separators; Centrifugal. — J. Bromet, F. Thorina, and H. C. Wood, Tadmecaster. Eng. Pat. 1712, Jan. 22, 1914.

THE basket of the separator consists of an upper cylindrical and a lower conical portion, separated by a partition but communicating at the periphery. A helical scraper mounted on an inner drum, and rotated on a sleeve carried on the main shaft at a different speed to the basket, serves to detach the solid matter and discharge it into the lower chamber, from which it is removed by an adjustable scraper entering through a central discharge opening.—W. H. C.

Separating heavy particles floating in a liquid or gas; Centrifugal devices for. — J. H. Fedeler, New York. Eng. Pat. 5621, March 5, 1914. Under Int. Conv., March 15, 1913.

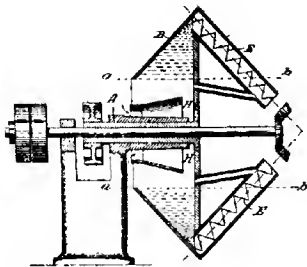
THE gas is passed longitudinally through a drum fixed within a casing. A central shaft extending through the drum and casing carries curved blades, the rotation of which imparts a centrifugal motion to the gas; the heavy suspended particles are thrown to the periphery of the drum, and pass through small openings into the outer casing.—W. H. C.

Purifying gaseous fluids by means of a centrifugal fan or centrifugal compressor; Apparatus for. — Soc. d'Exploitation des Appareils Rateau, Paris. Eng. Pat. 13,930, June 9, 1914. Under Int. Conv., June 11, 1913.

THE gas is passed through a fan and, leaving with a high tangential velocity, passes through a whirling chamber into and through a turbine provided with fixed vanes and moving rotor blades, so arranged that the gas travels through the turbine in a radial direction. The rotors of the turbine are mounted on a shaft, which is independent of the fan shaft. (See also Eng. Pat. 22,131 of 1901; this J., 1902, 1322.)—W. H. C.

Separating solid substances from liquids; Centrifugal machine for —. G. Jahn, Arnswalde, Germany. U.S. Pat. 1,124,907, Jan. 12, 1915. Date of appl., April 23, 1914.

THE material is fed through the aperture, A, into the rotating conical drum, B, closed at one end by a diaphragm. H. The separated material



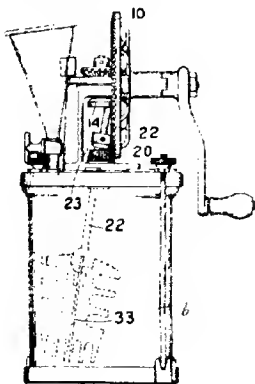
is discharged through openings at the periphery of the diaphragm into the outlet conduits, E. The latter are provided with conveyors and carry telescopic outlet pipes, connected, by means of rods, with a sleeve on the shaft so that they may be moved whilst the drum is rotating.—W. H. C.

Clarifier for liquids; Centrifugal —. F. P. Mason, New York. U.S. Pat. 1,126,247, Jan. 26, 1915. Date of appl., April 25, 1914.

THE liquid is fed into the central tube of a rotary bowl and is forced to pass first towards the periphery, and then in the reverse direction through a number of concentric perforated cylinders, situated within and rotated with the bowl. The perforations in adjacent cylinders are staggered with respect to one another, but those of alternate cylinders are in the same radial plane. The clarified liquid is discharged from the innermost cylinder.—W. H. C.

Mixing machines. E. C. R. Marks, London. From Landers, Frary, and Clark, New Britain, Conn., U.S.A. Eng. Pat. 16,753, July 14, 1914.

THE agitator, 33, curved to suit the curved bottom of the vessel, b, is mounted on the shaft, 22, which is supported by the collar, 23, in the sleeve,



20, and rotated with it. The upper end of the shaft is fitted eccentrically into the disc, 14, so that as the latter is rotated the agitator is swung

round the vessel and at the same time rotated on its own axis. The collar, 20, and the disc, 14, are both rotated by the wheel, 10.—W. H. C.

Paint and the like dipping tanks; Fluid-tight joints for shafts and the like of agitators of —. Wilkinson, Heywood and Clark, Ltd., F. G. Kidd, and W. McLaughlin, London. Eng. Pat. 27,111, Nov. 25, 1913.

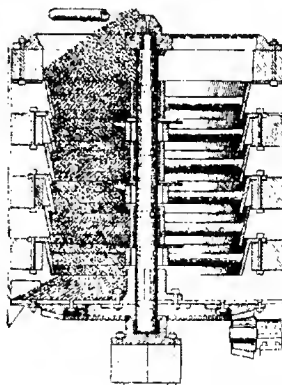
A FLANGED sleeve fitted on the agitator shaft is pressed by springs or the like against the surface of the side of the tank through which the shaft and sleeve pass, so that the flange makes a rubbing, fluid-tight joint therewith.—W. H. C.

Crushing, pulverising, or disintegrating machines. R. Emmott, Burnley. Eng. Pat. 2759, Feb. 3, 1914.

IN apparatus in which revolving beaters or hammers enter the spaces in curved grids forming the lower portion of the grinding chamber, curved grids, or plates, or bars are also provided in part of the upper portion of the chamber. These plates have rows of teeth or projections between which the beaters pass. The teeth in adjacent rows are staggered in relation to one another.—W. H. C.

Triturating device. F. K. Hoover and A. J. Mason, Chicago, Ill. U.S. Pat. 1,124,442, Jan. 12, 1915. Date of appl., June 9, 1911.

OVERLAPPING rings are supported by "spiders" one above the other, from a central shaft, and have beater arms projecting towards the shaft;



alternate rings are rotated. The material to be treated is fed into the top of the hollow space enclosed by the rings and passes downwards, to a supporting plate below, from which it is discharged by a scraper.—W. H. C.

Filler presses. C. J. Grace, Truro. Eng. Pat. 3212, Feb. 6, 1914.

SUBSIDIARY inner frames of light construction are fitted into the ordinary heavy frames and can be lifted out with the cake when the press is discharged. A current of electricity may be passed through resistance wires stretched across the subsidiary frames to dry the cake before discharge.—W. H. C.

Filtering pans. W. E. Trent, Reno, Nev. U.S. Pat. 1,125,769, Jan. 19, 1915. Date of appl., June 7, 1913.

SEVERAL pans, spaced apart and connected together, are arranged one above the other and

are all supported by hollow trunnions. Each pan contains a filter frame covered with filtering medium, and the interior of each filter frame is connected with a vacuum pump through one of the hollow trunnions. Each pan has a distributing trough and a supply pipe from a common main for supplying the material to be filtered, and also a pipe for the supply of water under pressure to wash out the solid deposit.—W. H. C.

Distilling a great quantity of a liquid in a small space; Apparatus for—Naamlooze Venootschap Maatschappij Destillator, and H. Middelbeek, Rijswijk, Netherlands. Eng. Pat. 1685, Feb. 23, 1914.

The liquid is sprayed from a ring-shaped perforated tube, fixed in the upper part of the distilling chamber, at such an angle that the spray strikes the wall of the vessel obliquely and is diverted into the body of liquid, leaving the central space through which the vapour rises free from spray.—W. H. C.

Evaporating apparatus. C. W. Zastrow, Wood's Hole, Mass. U.S. Pat. 1,124,096, Jan. 5, 1915. Date of appl., July 31, 1911.

An evaporating chamber is provided with a series of perforated baffles supported on angle rings fixed to the interior of the casing. The baffles can move up and down between the limits of the angle rings, and the perforations in successive baffles form a staggered series of openings. The liquid is heated by steam passing downwards through a number of vertical coils.—W. H. C.

Evaporation; Process of—F. B. Hobbes, Woodbury, N.J., Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,126,171, Jan. 26, 1915. Date of appl., Jan. 14, 1914.

Liquids which tend to become acid during evaporation are evaporated in the presence of freshly-precipitated aluminium hydroxide.—W. P. S.

Vacuum-pan. C. P. Grimwood, New York. U.S. Pat. 1,126,757, Feb. 2, 1915. Date of appl., March 30, 1914.

The pan is divided into compartments the sides of which are closed by hollow transverse partitions provided with superposed horizontal passages. The heating medium is supplied to the horizontal passages through valved pipes connecting them in horizontal sets.—W. H. C.

Evaporator. L. M. and McK. Jennings, Star, Va. U.S. Pat. 1,126,767, Feb. 2, 1915. Date of appl., March 12, 1914.

An evaporating pan is provided with a scum discharge trough formed on one side between the upturned bottom of the pan and the side wall. Means are provided for producing in the liquid surface currents flowing towards the scum discharge trough.—W. H. C.

Furnaces; Process of forming and repairing the linings of—A. Schwarz, Assignor to New York Cement Gun Co., New York. U.S. Pat. 1,125,741, Jan. 19, 1915. Date of appl., March 3, 1913.

FIRELY divided refractory material is projected on to the furnace wall, which is maintained at fusing temperature at the point where the material is being applied.—W. H. C.

Liquids; Apparatus for impregnating—with gases (carbon dioxide). J. F. Wittmann, Lakewood, N.J., and R. W. Wittmann, Brooklyn, N.Y., Assignors to Amaranth Machinery and Supply Works, Inc., New York. U.S. Pat. 1,128,264, Feb. 9, 1915. Date of appl., July 13, 1911.

A carbonating vessel is provided with an inlet neck controlled by an automatically operated valve. A liquid-supply conduit leads to and surrounds the lower part of the neck, and a closed transparent chamber, connected at its lower end with the end of the liquid-supply conduit, surrounds the upper part of the neck and the valve; a vent is provided on this transparent chamber, and a gas-supply pipe extends through it into the neck.—J. F. B.

Desiccation and collection of substances in a finely-divided condition. J. S. Merrell and Merrell-Soule Co., Syracuse, N.Y., U.S.A. Eng. Pat. 4707, Feb. 24, 1914.

SEE FR. Pat. 468,859 of 1914; this J., 1914, 1024.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Nitrogen in coal and coke; Nature of compounds of—E. Terres. Chem.-Zeit., 1915, 39, 73.

GLYCOCOLL, asparagine, albumin, glue, pyridine, azobenzene, hydrazobenzene, acetonitrile, phenylisocyanate, and nitrobenzene were subjected to destructive distillation under conditions similar to those obtaining in coal distillation; only those substances containing an amino group or substituted amino group yielded ammonia, hence the substance in coal which yields ammonia on dry distillation is probably of an albuminous nature. Extracts of coal with organic solvents contained more nitrogen than the insoluble residue, but the presence of amino groups in the extracts could not be proved. Coke when treated with steam at high temperatures yielded over 89% of its nitrogen as ammonia when precautions were taken to prevent decomposition of the latter, agreeing with the assumption of Rau and Christie that the nitrogen of coke is present as a nitride of carbon.—T. C.

Nitrogen in coal; A comparison of various modifications of the Kjeldahl method with the Dumas method of determining—with notes on errors in the Dumas method due to nitrogen evolved from the copper oxide. A. C. Fieldner and C. A. Taylor. J. Ind. Eng. Chem., 1915, 7, 106–112.

COMPARATIVE determinations were made with eight different samples (seven coals and one lignite) containing from 0.8 to 1.8% N. The highest and most concordant results were obtained by the combined Kjeldahl-Gunning method, using both mercury and potassium sulphate, as proposed by Dyer (this J., 1895, 694). The quantity of potassium sulphate should be from 7 to 15 gms. per 30 c.c. of sulphuric acid; with larger amounts losses of nitrogen may occur (compare this J., 1912, 361; 1913, 215). Mercury was more effective than copper sulphate as a catalyst, and potassium sulphate was superior to phosphorus pentoxide for raising the boiling point of the mixture. With the official (U.S.A.) Gunning method the results were 0.2–0.3% too low, even after digesting for 4 hours. In all modifications of the Kjeldahl method it was necessary to digest for about 2 hours after the mixture became

colourless to secure maximum results with coal. With the Dumas method the greatest difference in the average values was 0.1% and the mean difference was 0.05%. Errors due to nitrogen present in the copper oxide may be minimised by using "wire-form" oxide pulverised to pass a 40-mesh and be retained by a 100-mesh screen, heating it for several hours *in vacuo*, and cooling in an atmosphere of carbon dioxide.—A. S.

Firedamp testers. E. Beckmann and C. Steglich. *Chem.-Zeit.*, 1915, 39, 3-6.

A SIMPLE test for methane consists in drawing mine-air into a cylindrical container and sparking with a cerium-iron igniter; air containing from 7 to 10.3% of methane is thus ignited and the resulting rise of pressure is indicated by a gauge. A more accurate tester consists of a brass or nickel cylinder which communicates with a mercury manometer: the mine-air is drawn into the vessel by a pump and is then ignited by a platinum spiral heated to bright redness by an electric current. The carbon dioxide and water formed by the combustion of methane, etc., are absorbed by stick potassium hydroxide, which is left in the vessel for a large number of tests. When the temperature has again become normal the change in pressure is read off on the manometer. About 100 grms. of potassium hydroxide is placed in the vessel, which will then hold 140 c.c. of the air-sample. The heating current for the platinum spiral is cut off automatically after 2 minutes, and a safety device makes it impossible to pass the current while there is communication between the inside of the vessel and the outer air. As little as 0.5% of methane is plainly indicated. Various forms, portable and stationary, with and without automatic alarms, etc., are described. With 10% of methane a maximum diminution of pressure is given; 20% gives a slight positive pressure, and this attains a maximum with 40%. In doubtful cases a little pure air is admitted and the test repeated.—T. ST.

Gas flames: Observations on— Haber. *Dents. Physik. Ges.*, July 21, 1914. *Chem.-Zeit.*, 1914, 38, 1113.

ANALYSES have shown that the composition of the gases at the tip of a flame differs from that of the gases at the edge. A separation takes place within the inner cone, the heavier constituents passing to the tip, and the lighter to the edges of the flame. This separation is not due to the current of the gases, but is a function of the flame. —C. A. M.

Benzol in gas; Determination of— A. Krieger. *J. Gasbeleucht.*, Feb. 6, 1915, 61. *J. Gas Lighting*, 1915, 129, 450.

MOST of the methods available for determining benzol in gas are more suitable for coal gas than coke-oven gas, which contains considerably less benzol. The author has modified Müller's method of washing the gas with cooled paraffin oil, and by using an improved absorption apparatus has made the method available for coke-oven gas. The gas is passed for eight hours at the rate of about 40 litres per hour through a washing oil contained in two cylinders (50 c.c. in each), maintained at -18°C . The cylinders are 9 ins. high and 2 ins. diam., and the gas is introduced through a tube ending in a perforated hood. The outlet tube fits in a tube, similar to a test-tube, filled with glass beads and extending downwards inside the cylinder; this tube has a small hole in the bottom, and a ring of holes about $\frac{1}{4}$ in. above the bottom. The cylinder is weighed before and after the absorption, and it is claimed

that the benzol is absorbed practically quantitatively. The most suitable washing oil is one which does not yield more than 10% of distillate below 200°C . nor less than 90% below 300°C . The best tar oil for washing purposes is one which distils between 240° and 260°C . It is not necessary to use paraffin oil for the purpose, although its freedom from colour is an advantage.—E. R. A.

Benzol, alcohol, and mixtures of these liquids with petrol as fuels for internal combustion engines. W. Watson, C. W. Frost, W. C. Lloyd, F. W. Richards, W. J. Stern, H. Shaw, and J. Wilson. *Inst. Automobile Eng.*, Dec., 1914. [Separate copy.] 20 pages.

THE question of carburation, particularly when starting, and in cold weather, with fuels such as benzol, alcohol, and some of the heavier brands of petrol, is of great importance, and tests have been carried out comparable with those of petrol, the results of which have been published (*Proc. Inst. Automobile Eng.*, 7, 35).

Benzol. The benzol used was similar in character to two samples purchased at different garages, and became practically solid at -12°C .; the first indications of crystallisation occurred at -1°C . The crystals at once sink in the liquid, and risk of choking the jet of the carburettor, as well as that of impeding the flow of liquid, is incurred. Even if crystals do not separate, the viscosity of the liquid at low temperatures may be sufficiently increased to influence the supply of fuel. The viscosity of benzol increases at a greater rate than that of petrol, and in cold weather it is important to heat the jet of the carburettor, or any constriction in the fuel-supply service. A mixture of one part of petrol to three parts of benzol starts depositing at -11°C . whilst a mixture of equal volumes of these liquids gives no deposit at -21°C . It would be advantageous always to mix 30% of petrol with benzol. The knocking produced at low engine speeds when petrol is used as fuel is not observed with benzol. This appears to be due to the fact that the critical temperature above which the charge fires in a way resembling detonation rather than inflammation, is much lower for petrol. Benzol added to petrol causes a marked increase in the critical temperature, and an engine which knocks badly with pure petrol runs quite smoothly with a mixture of equal parts of benzol and petrol. When using less than twelve parts of air to one of benzol by weight the deposit of carbon in the engine is excessive, and the efficiency is greatly impaired. If the mixture is so adjusted that practically no carbon monoxide is found in the exhaust gases, the carbon deposit is no worse than with petrol.

Alcohol. Experiments were made with ordinary methylated spirit in a jet carburettor, a larger jet being used than in the case of benzol and petrol; it was also found necessary to supply additional heat to the carburettor, which was done by passing a current through a wire wound round the pipe leading from the jet to the throttle. This was not altogether sufficient, and owing to the irregular vaporisation of the fuel, irregular exhaust gas measurements were obtained. The mean effective pressures obtained with alcohol were slightly higher than those obtained with either petrol or benzol, and increased more rapidly with the strength of the mixture than in the cases of the other fuels. When using the strongest mixture, six parts of air to one of alcohol, the mean effective pressure was still increasing with the strength of the mixture, and 6% CO was found in the exhaust gases. Obviously this means that maximum power can only be attained by appreciable loss due to incomplete combustion.

Maximum thermal efficiency, as also that at complete combustion, increases slightly from petrol

to benzol and benzol to alcohol, and the temperatures attained with the three fuels do not differ much, though those with alcohol are a little lower than the others, which may account for the slightly higher thermal efficiency obtained with alcohol. Unless the vapour tension of the fuel in the cylinder is above a certain limit it is impossible to obtain an explosive mixture. This difficulty may be easily overcome in the case of petrol, as owing to the presence of highly volatile constituents it is possible to flood the cylinder and so obtain an explosive mixture. With benzol and alcohol no such volatile bodies are present, and consequently starting difficulties are encountered in cold weather. Experiments with different liquid fuels were made in a closed vessel, and it was found that with a very volatile brand of petrol an explosive mixture could be obtained at 0° C. and a pressure of 40 lb. per sq. inch. Air saturated with benzol vapour below 1° C. at atmospheric pressure is incombustible, and at all temperatures below 20° C. air saturated with alcohol vapour is incombustible even at atmospheric pressure. These results, together with others obtained from mixtures of these liquids, are shown graphically. When used in the engine the heat generated by the compression produced by starting the engine by hand is sufficient to vaporise the fuel, except, perhaps, in the case of alcohol, or, when the fuel is already vaporised, to keep it in the form of vapour during the compression.—E. R. A.

Gas: Variation in the composition of coal—according to the conditions of manufacture. J. G. Newbigging. Presidential address to Manchester Dist. Inst. Gas Eng., Feb. 27, 1915. J. Gas Lighting, 1915, 129, 507—510.

COMPARATIVE tests of a total heat calorimeter and a Boys calorimeter, extending over some months, showed an average difference of 7 B.Th.U. in favour of the Boys calorimeter. On two occasions only were higher results obtained from the total heat calorimeter.

The value of systematic gas analysis in gasworks practice is shown in a table, giving the analyses of gas taken at the inlet to the retort house governor. With the gauge showing one-tenth inch pressure, methane varied from 31.8 to 39.1%; nitrogen, 4.7—9.4%; total non-combustibles, 8.3—12.9%; calorific value (B.Th.U. per cb. ft.), 580—677. With the gauge level, CH_4 , 23.5—27.5%; N, 16.7—25.9%; total non-combustibles, 21.4—30.3%; calorific value, 439—511. With gauge showing one-tenth inch vacuum, CH_4 , 18.0—25.4%; N, 20.0—34.2%; total non-combustibles, 29.5—39.5%; calorific value, 356—466.—E. R. A.

Natural gas found in Ontario; Chemical composition of—. G. R. Mickle, W. H. Ellis, J. W. Bain, and E. G. R. Ardagh. Reprint from 23rd Report of Bureau of Mines, Ontario, 1911. 39 pages.

As far as at present ascertained, the natural gas of Ontario is "dry," i.e., not intimately associated with oil. Samples obtained direct from wells in the principal counties, were analysed according to the recommendations of Burrell and Seibert (Bull. 42, U.S. Bureau of Mines; see this J., 1913, 1096; 1914, 808), the separation of methane from its higher homologues being effected by liquefaction, for which liquid air was employed. Analyses of 40 samples of gas from different sources gave the following results: methane, 68.3—93.7; ethane, 0 to 19; propane, 0—3.5; nitrogen, 2.8—17.0; carbon dioxide, 0—1.65; hydrogen sulphide, 0—0.8; oxygen, 0—0.3%; olefines, carbon monoxide, and hydrogen were absent in all cases. The comparative uniformity of composition shown by the gases from widely separated areas is

apparently incompatible with the idea of a local and separate origin for each field. The influence of declining pressure on composition is also discussed and the necessity for the systematic sampling of wells during the whole of their productive life is emphasised.—W. E. F. P.

Natural gas from which gasoline is condensed; Separation of the constituents in a—. G. A. Burrell and F. M. Seibert. J. Amer. Chem. Soc., 1915, 37, 392—396.

A NATURAL gas from which gasoline is condensed on a commercial scale gave the following results upon analysis by fractional distillation *in vacuo* at low temperatures (see this J., 1913, 1096; 1914, 808): methane 36.8, ethane 32.6, propane 21.1, butanes 5.8, pentanes and hexanes 3.7 vol. %.—J. R.

Gasoline vapour in air; Determination of—. G. A. Burrell and I. W. Robertson. J. Ind. Eng. Chem., 1915, 7, 112—113.

Two methods are described. In the first the mixture of gasoline vapour and air is introduced into a bulb tube containing phosphorus pentoxide to absorb any moisture, the tube is cooled by means of liquid air to condense the gasoline, the air is withdrawn by means of a vacuum pump, and the tube is then removed from the liquid air, whereupon the gasoline vaporises and may be estimated by observing its pressure. In the second method, the gasoline vapour is burned with air or oxygen, and the contraction in volume and amount of carbon dioxide produced are determined. Results calculated by dividing the volume of carbon dioxide by 5 or the contraction in volume by 1, i.e., on the assumption that the gasoline vapour consists entirely of pentane, agree with those obtained by the use of liquid air.—A. S.

Gasoline from synthetic oil. W. O. Snelling. Amer. Inst. Mining Eng., Feb., 1915. Eng. and Min. J., 1915, 99, 379.

By heating hydrocarbon material low in hydrogen (e.g. vaseline, rod wax, gas oil, fuel oil, etc.) in a closed vessel until a pressure of 800—900 lb. was attained, the material occupying between $\frac{1}{2}$ and $\frac{3}{4}$ of the space within the vessel, a more or less definite mixture of hydrocarbons, resembling crude petroleum in appearance and constitution, was obtained; the excess carbon was deposited as mud, and a residual pressure of about 150 lb., due to the formation of about 2% of "natural gas," remained in the vessel after cooling. By alternately distilling the synthetic "crude oil" produced and reconvertng the residue under pressure, from 50 to 70% of the original hydrocarbon material was obtained as gasoline (about 70° B., sp. gr. 0.67), suitable for use as ordinary gasoline but having a milder and sweeter odour.—W. E. F. P.

Bitumen and other viscous substances; Determination and drying of—. E. Bornemann. Chem. Zeit., 1914, 38, 1132.

A SMALL pulley is fitted at the lower end of a rod which passes upwards in an inclined direction through one side of an ordinary drying oven. The end of the rod inside the oven is fixed to the bottom of a crucible, which is thus supported in an inclined position. The bitumen is placed in the crucible, and when the pulley is set in motion the rotation of the crucible causes a constant exposure of fresh surfaces of the bitumen. Drying is effected first at 60° C. until most of the solvent is driven off, and then at 105° C., for about 3 hrs. The crucible is cooled in a vacuum desiccator; if a scum of bubbles forms on the surface, the sample is not free from solvent and air, and the crucible must be returned to the drying oven.—J. H. J.

Wood charcoal filler for the waste gases from [ammonium] sulphate plant. Reinhard. See VII.

Determination of sulphur in organic substances [coal, coke, etc.]. Krieger. See XXIII.

PATENTS.

Carbonaceous [fuel] wastes; Utilisation of —. J. M. W. Kitchen, East Orange, N.J. U.S. Pat. 1,127,777, Feb. 9, 1915. Date of appl., July 22, 1913.

A HARD fuel free from volatile constituents is mixed with a softer fuel containing volatile constituents and a thick bed of the mixture is introduced into a furnace. Part of the fuel is burnt under forced draught, and the products of combustion are forced through the remainder, thus producing a combustible gas. This gas, with or without the addition of enriching gas, is superheated, washed, and burnt with the correct proportion of air under pressure.—W. F. F.

Fuels of low sulphur content; Manufacture of —. A. Fingerland, A. Indra, and A. Lissner. Ger. Pat. 279,817, April 4, 1914. Addition to Ger. Pat. 270,573 (this J., 1914, 411).

NATURAL or artificial fuels of high sulphur content are heated with metals, oxides, hydroxides, or salts capable of acting as catalysts in the subsequent treatment, and are then treated cold with acids or acid liquids.—A. S.

Coke; Process of making — and recovering by-products. C. A. Weeks, Assignor to T. R. Patton and F. C. Mencke, Philadelphia, Pa. U.S. Pat. 1,127,949, Feb. 9, 1915. Date of appl., July 25, 1911.

COAL is fed into a closed oven and burnt from below upwards by a regulated supply of air. The gases are withdrawn by suction from the space above the coal, till the latter becomes heated throughout, when the upper part of the oven is opened to the air and the coking completed.—W. F. F.

Gas producers [for peat]. The International Nitrogen and Power Co., Ltd., and O. D. Lucas. London. Eng. Pat. 476, Jan. 7, 1914.

WET fuel such as peat is fed to an air-locked hopper above the producer, through an inclined tube provided with a rotating worm, and heated by hot gases from the producer passing through a concentric outer tube. Moisture is drawn off from the fuel by a pipe at a point near the hopper and delivered with a regulated supply of air to the producer hearth. Tar deposited in the outer tube is fed downwards by a rotary scraper and drawn off. In an alternative form, the feed tube is itself rotated.—W. F. F.

Coal gas and the like; Means and method of producing —. [Recovery of pitch.] W. B. Davidson, Birmingham. Eng. Pat. 9051, April 9, 1914.

THE gas is delivered by dip pipes into a hydraulic main provided with a rotating paddle or archimedean screw along the bottom, which prevents the deposition of solid pitch and agitates the mixture of tar and pitch to expose fresh surfaces to the hot gases. By the fractional distillation of the tar in this way, by the hot gases, for a given time, pitch of any desired quality can be produced in installations of vertical retorts, coke ovens, or similar plant, where the hydraulic mains are sufficiently hot. The level of liquid in the main is regulated by a hand-operated lift valve at one end.—W. F. F.

Gas; Art of generating —. W. B. Chapman, Brooklyn, N.Y., Assignor to Chapman Engineering Co., New York. U.S. Pat. 1,125,962, Jan. 26, 1915. Date of appl., Nov. 23, 1908.

THE raw fuel is contained in a closed chamber opening into the upper part of the producer chamber at one side. The producer chamber is in three sections, the upper and lower ones being rotated and the intermediate one stationary. Gases evolved from the raw fuel are withdrawn through a pipe and delivered into the stationary portion of the mass of incandescent fuel in the producer chamber.—A. S.

Water-gas from bituminous fuels; Process for increasing the yield of by-products in the manufacture of — by the intermittent process. Dellwik-Fleischer Wassergas-Ges. m. b. H. Ger. Pat. 278,512, Nov. 4, 1913. Addition to Ger. Pat. 275,221.

A MIXTURE of steam and air is introduced into the producer above the column of incandescent coke, so as to provide that excess of steam which is favourable to a high yield of by-products without materially cooling the gas-producing material. The loss of heat due to the introduction of wet, low-temperature steam is compensated by the heat produced by combustion of some of the water-gas by the air introduced with the steam. (See also Fr. Pats. 466,421 and 466,422 of 1913; this J., 1914, 585.)—A. S.

Town gas; Process for purifying and treating —. D. Koechlin, Paris. Eng. Pat. 5761, March 6, 1914.

THE lighter gases (mainly methane and hydrogen) obtained during the latter part of the distillation of coal, with or without addition of water-gas, are passed in succession through two chambers containing iron oxide at 120° C. and nickel at 300° C., and are mixed with the heavier hydrocarbons obtained in the earlier stages, which have been passed through a chamber heated to redness. The iron oxide and nickel may be heated by passing flue gases above 300° C. around the two chambers in the opposite direction to the treated gas. The nickel may be regenerated by adding 0.25 to 2% of air to the gas to be treated. (See also Fr. Pat. 466,197 of 1913; this J., 1914, 585.)—W. F. F.

Oils [petroleum]; Process of improving —. A. McD. McAfee, Bayonne, N.J. U.S. Pat. 1,127,465, Feb. 9, 1915. Date of appl., Feb. 12, 1911.

CRUDE asphaltic petroleum is heated to remove low-boiling oils and moisture, aluminium chloride is added, and the low-boiling oils thus formed are distilled off. The residue, amounting to at least 30% of the original oil, is cooled and the aluminium chloride removed.—W. F. F.

Vertical retorts; Regenerator-setting for —. S. Glover, St. Helens, and J. West, Southport. U.S. Pat. 1,127,228, Feb. 2, 1915. Date of appl., Aug. 6, 1914.

See Eng. Pat. 18,599 of 1913; this J., 1914, 910.

Petroleum and the like; Apparatus or boiler for the distillation of hydrocarbons such as —. T. Delort, Baicoi, Roumania. Eng. Pat. 3210, Feb. 6, 1914. Under Int. Conv., Feb. 8, 1913.

See Fr. Pat. 469,954 of 1913; this J., 1914, 951.

Oil-retort. J. Weiser, Vienna. U.S. Pat. 1,127,951, Feb. 9, 1915. Date of appl., Oct. 6, 1911.

See Eng. Pat. 18,063 of 1911; this J., 1912, 864.

Complete extraction of the industrial chemical products contained in crude ammoniacal liquor. Addition to Fr. Pat. 468,535. See VII.

IIb.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Heat-producing compound. W. F. McNabb and R. S. Wile, Pittsburgh, Pa. U.S. Pat. 1,126,055, Jan. 26, 1915. Date of appl., Oct. 28, 1913.

A MIXTURE of sodium peroxide, aluminium, and an alkali carbonate.—W. F. F.

Heat-generating furnace. W. Thomas and A. E. Mainwaring, Nanaimo, B.C., Canada. U.S. Pat. 1,128,199, Feb. 9, 1915. Date of appl., July 9, 1914.

THE fuel is fed through a coking and gasifying retort into the combustion chamber. Gas is drawn off from the retort, mixed with air, and passed under pressure into hollow grate bars supporting the incandescent fuel, and carrying Bunsen injectors opening into the fuel.—W. F. F.

Exhausting vessels [incandescence lamp bulbs]; Method of—. C. J. Thatcher, Upper Nyack, N.Y. U.S. Pat. 1,124,555, Jan. 12, 1915. Date of appl., March 11, 1910.

AFTER a preliminary mechanical exhaustion, the residual gas is absorbed by a solid, non-volatile absorbent contained in the lamp bulb or in an auxiliary vessel connected with it, the absorption being hastened by heating the lamp filament to intensive incandescence and thereby ionising the particles of the residual gas.—W. H. C.

Arc-lamp electrode. A. T. Baldwin, Lakewood, Ohio, Assignor to National Carbon Co., Cleveland, Ohio. U.S. Pat. 1,127,578, Feb. 9, 1915. Date of appl., May 22, 1913.

THE electrode contains carbon and a product obtained by fusing together cerium oxide, 3 parts, zirconium oxide, 2 parts, and tungstic oxide, 1 part.—W. F. F.

Arc lamp electrode. Ver. Chem. Fabr. Landau, Kreidl, Heller und Co. Ger. Pat. 278,731, Jan. 29, 1913.

ALKALI or alkaline-earth compounds of zirconium oxide or titanium oxide or of acids of high melting point are used, preferably in the colloidal condition, in the manufacture of mineralised arc lamp electrodes, the proportion of alkali or alkaline-earth or of acid, in all cases, being below that corresponding to a normal salt. In the case of mixtures with low content of alkali or alkaline-earth, small quantities of a compound of hydrofluoric acid are also added. The compounds mentioned may be prepared by the partial decomposition of alkali or alkaline-earth zirconates or titanates with water or acids to remove part of the base, or by the partial removal of silicic acid from silicates or of acids of high melting point from their compounds.—A. S.

III.—TAR AND TAR PRODUCTS.

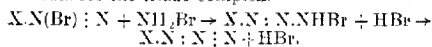
Bromination of aromatic amines. W. Fuchs. Chem.-Zeit., 1915, 39, 73.

BROMINATION of monosubstituted anilines is best carried out using glacial acetic acid as solvent.

The bromine atoms always enter the ring in the *p*- and in the two *o*-positions to the amino group unless one of the latter is already occupied, so that the directing influence of the amino group is stronger than that of any other group.—T. C.

Azotisation by chloroamine. M. O. Forster. Chem. Soc. Trans., 1915, 107, 260—267.

AN aqueous solution of chloroamine, prepared by adding ammonia to sodium hypochlorite solution, reacts with the diazonium group, transforming it into the triazo-nucleus, phenyl-diazonium chloride for example yielding phenylazoinide. This suggests that the formation of phenylazoinide from benzenediazonium perbromide by the action of ammonia occurs through the intermediate agency of bromoamine, and that the perbromide is not a hydrazine derivative as maintained by Chattaway (this J., 1915, 174), but a true perhaloid. Further it supports the $-N:N:N$ formula for the triazo-complex.



Chloroamine will also react with the isonitroso-group, diazoacanthor being produced, for example, from isonitrosoacanthor in 70% yield, and with ammonia and certain ammonia derivatives such as piperidine, hydrazines are formed, probably according to the equation, $H_2N.OH + H_2NCl = H_2O + HCl + H_2N.N \rightarrow H_2N.NH_2$ —G. F. M.

PATENTS.

Tar distillation products; Process for obtaining low-boiling—. M. Melamid and L. Grötzinger. Ger. Pat. 278,192, Aug. 21, 1913. Addition to Ger. Pat. 261,811.

TAR, tar oil, or the like is treated with phosphoric acid in a state of fine subdivision, the mixture being heated and vigorously agitated. (See also Eng. Pats. 9856 of 1912 and 5184 of 1913, Fr. Pat. 433,650 and Additions thereto and Ger. Pat. 276,765; this J., 1912, 977; 1913, 415, 820, 861, 1000; 1915, 22.)—A. S.

Oxidation of organic compounds; Preparation of the products of—. K. Hofmann. Ger. Pat. 277,733, Jan. 31, 1913.

OXIDATION is effected by the action of nitrates or chlorates, or mixtures of these, in presence of magnesium salts, at a high temperature. In this way it is possible to prepare cheaply and simply anthraquinone from anthracene, oxalates from sawdust, Aniline Black from aniline, etc. (See also this J., 1914, 742.)—A. S.

Aminobenzothiazolcarboxylic acids or their acetyl derivatives; Preparation of—. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 277,395, May 9, 1913.

ACETYL-DERIVATIVES of aminothiazoles of the benzene series, containing at least one methyl group in the benzene nucleus, are oxidised with permanganate in neutral or alkaline solution, and if desired, the acetyl group is removed from the products. The acetylamino-benzothiazolcarboxylic acids thus obtained are useful for the preparation of dyestuffs. They are pale yellow substances, which cannot be diazotised; their alkali salts are soluble in water.—A. S.

*Isatin-*a*-aryldes, their homologues, or derivatives substituted in the nucleus.* Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 277,396, Sept. 4, 1913.

HYDROCYANOCARBODIARYLIMINES of the benzene series are treated with anhydrous aluminium

chloride in the presence of inert solvents or diluents. (See also Eng. Pat. 30,072 of 1913; this J., 1914, 246.)—A. S.

2-Hydroxynaphthalene-6-sulphonic acid; Preparation of derivatives of —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 278,091, Feb. 18, 1913. Addition to Ger. Pat. 276,331 (see Fr. Pat. 466,236; this J., 1914, 637).

THE sulpho-chloride of 2-hydroxynaphthalene-1-carboxylic acid is condensed with ammonia, amines, phenols, aminophenols, aminohydroxynaphthalenes, or their carboxylic or sulphonic acids or other derivatives or substitution products, and the carboxyl group is removed from the condensation products. This can be done very readily in the case of the condensation product from 2-hydroxynaphthalene-1-carboxy-6-sulphochloride, e.g., by warming in aqueous solution or suspension or by combining with diazo compounds.

—A. S.

Anthraquinone derivatives containing sulphur; Preparation of —. Farb. vorm. Meister, Lucius, und Brüning. Ger. Pat. 277,439, Oct. 27, 1912.

ANTHRAQUINONYLMERCAPTANS or anthraquinonyl disulphides are treated with halogens, with exclusion of water. The products, which may be used for the preparation of dyestuffs, combine with alcohols to form ester-like compounds, which on saponification yield sulphenic acids containing the S.OH group. With phenols they form hydroxyarylanthraquinonyl sulphides, and with aromatic hydrocarbons, in presence of aluminium chloride, they yield arylanthraquinonyl sulphides.

—A. S.

IV.—COLOURING MATTERS AND DYES.

Myrica rubra; The colouring principle of —. Its azo-, sulphide-, and nitro-dyestuffs. S. Satow. J. Ind. Eng. Chem., 1915, 7, 113—115.

THE bark of *M. rubra* has been used from ancient times in Japan for dyeing yellow and black. There are two varieties: that bearing the larger fruit yields more colouring matter of stronger tinctorial power than the other. The colouring matter, when isolated and purified by treatment with lead acetate and recrystallisation from acetone, agreed in composition, $C_{15}H_{10}O_8.H_2O$, and in most of its properties with the myricetin of Perkin (this J., 1895, 458; 1896, 662). The black produced by myricetin on iron mordant resists practically all tests; the orange brown colour on chrome mordant stands next to the black in regard to fastness. The single-bath method of dyeing gives the best results, especially with tin (orange yellow), alumina (yellow), and chrome mordants. By using myricetin as a component, several orange to brown azo dyes were prepared, and a new method of batik dyeing was devised. The cloth is dipped in an alcoholic solution of myricetin, dried without washing, coated on both sides with a mixture of resin and Japan wax, and the cold coating cracked by hand, after which the material is dipped in a diazo solution to develop the colour. After cracking the coating, the fabric may be immersed in dilute alcohol for a few seconds and then dipped in the diazo solution, whereupon several shades of colour are produced, according to the degree to which the coating has been dissolved by the alcohol. By fusing myricetin with sodium polysulphide solution, a sulphide dyestuff, dyeing cotton directly a deep sepia colour, was obtained, whilst by adding copper

sulphate to the mixture before heating, a product of greater tinctorial power and giving a bluish brown shade was produced. A dyestuff giving yellowish brown tints on animal fibres in an acid bath was obtained by fusing myricetin with sulphur, whilst by nitrating sulphonated myricetin a dyestuff giving bright yellow shades on animal fibres was produced.—A. S.

"Tree moss"; Colouring matter of —. A. Edge. J. Soc. Dyers and Col., 1915, 31, 74—75.

THE shade produced with "tree moss" is brown, similar to that obtained from "dye-crotches" (generally of the genus *Parmelia*), but the colouring matter exhibits differences from the ordinary dye lichens. The "tree moss" used was *Usnea hirta*, from old fir trees in South Wales: it is not so rich in colouring matter as *Parmelia*; four times as much is necessary to give an equal depth, but the colour is extracted and fixed on the wool almost as quickly as an ordinary acid colour. The bright yellow shade obtained after 20 minutes becomes orange brown on continued boiling. The yellow colour possesses an excellent resistance to scouring and mulling, and a very fair fastness to alkalis and to light. Pleasing shades of brown and fawn are obtained by treatment with metallic salts, but it does not appear suitable for dyeing on mordants. Lichens, such as the one under consideration, do not appear to give purple shades with ammonia. With the exception of turmeric, which is much inferior in fastness to alkalis, "tree moss" is the only natural direct-dyeing yellow known.—F. W. A.

Flavone group; Addition of auxochromes in the —. A. G. Perkin and E. R. Watson. Chem. Soc. Trans., 1915, 107, 198—200.

SINCE attempts to introduce an additional hydroxyl group into the quercetin molecule failed (this J., 1914, 305), similar experiments were carried out with luteolin and morin. Luteolin tetraethyl ether yielded only a tetranitro-derivative, but its mono-bromo-derivative gave on nitration bromo-6'-nitroluteolin tetraethyl ether. This was reduced to the amino-compound, diazotised, and boiled with water, yielding the hydroxy compound, but the conversion of the latter into hydroxyluteolin by means of hydriodic acid did not proceed smoothly and a perfectly pure product was not obtained. The impure hydroxyluteolin formed yellow needles, no deeper in shade than luteolin itself. Aminomorin was also prepared from nitromorin pentamethyl ether, but, like amino-quercetin, it could not be converted into the hydroxy-derivative, and the additional auxochrome did not produce any deepening in colour. The multiplication of auxochromes appears to widen the principal absorption band, but when this occurs, as in the above cases, at the violet end of the spectrum, it has very little effect on the visible colour.—G. F. M.

Pentahydroxyflavone; Preparation of a —. G. Bargellini and L. Monti. Gaz. Chim. Ital., 1915, 45, I., 61—69.

THE synthesis of 1,3,3',4',5'-pentahydroxyflavone was effected by Kostanecki's method (this J., 1902, 36, 1130), 2,4,6-trimethoxyacetophenone being condensed with the methyl ester of trimethylgallic acid in presence of sodium to give 2,4,6,3',4',5'-hexamethoxybenzoylacetophenone, which was heated with hydriodic acid, whereby the methyl groups were removed, and the resulting hexahydroxybenzoylacetophenone, reacting in its enolic form, lost 1 mol. of water and was converted into the desired pentahydroxyflavone. Attempts to hydrogenate this in presence of palladium black

and under slight pressure, to obtain the corresponding flavanone, proved unsuccessful, although chalcones, which contain the group, CO.CH:C , in the form of an open chain, are readily converted into hydrochalcones in this way. 1.3.3'.4'.5'-Pentahydroxyflavone is a yellow substance insoluble or sparingly soluble in the ordinary solvents. The crystals separated by adding water to an alcoholic solution contain water of crystallisation which is lost at 110°C . The anhydrous compound begins to decompose above 270°C . It dissolves in caustic soda with an orange red and in concentrated sulphuric acid with a yellow colour. —A. S.

Scutellarein; Constitution and synthesis of — G. Bargellini. *Gaz. Chim. Ital.*, 1915, 45, 1, 69—79.

SCUTELLAREIN, $\text{C}_{15}\text{H}_{10}\text{O}_6$, is formed together with glucuronic acid by the hydrolysis, with 30—40% sulphuric acid, of scutellarin, $\text{C}_{21}\text{H}_{18}\text{O}_{12}$, a glucoside-like substance found in *Scutellaria altissima* and other species of *Scutellaria*, *Galeopsis*, and *Tricarium*. The author has found that natural scutellarein is identical with a tetrahydroxyflavone synthesised from 2.3.4.6-tetramethoxyacetophenone and methyl anisate by Kostanecki's method (this J., 1902, 36, 1130; see also preceding abstract). This proves that scutellarein must be either 1.3.4.4' or 1.2.3.4'-tetrahydroxyflavone, in agreement with the alternative formulae suggested by Goldschmidt and Zerner (*Monatsh. Chem.*, 1910, 31, 439). —A. S.

Chlorophyll; Action of light on — H. Wager. *Proc. Linnæan Soc. Pharm. J.*, 1915, 94, 317—318.

CHLOROPHYLL, either as a film on glass or on paper, or in solution in petroleum spirit, or in dried leaves, or layers of *Euglena* or algae, as well as in the living leaf, is bleached when exposed to strong sunlight, an aldehyde and a substance which liberates iodine from potassium iodide being formed. The aldehyde is apparently not formaldehyde and the oxidising agent is not hydrogen peroxide. When chlorophyll is exposed to sunlight behind coloured filters, the formation of aldehyde and oxidising substance is more pronounced in the red than in the blue or green for the same exposure. This photo-decomposition takes place only in presence of oxygen, and carbon dioxide need not necessarily be present. The yellow pigment of chlorophyll is much more rapidly bleached than the green pigment. These reactions are not due to the chlorophyll pigments only, other substances being present, associated especially with carotin and xanthophyll, upon which the activity of the chlorophyll partly depends. —T. C.

Anthocyan; Later researches on — P. Q. Keegan. *Chem. News*, 1915, 111, 87—88. (See also this J., 1914, 18, 1199.)

THE view that anthocyan is not produced from a special chromogen but formed complete *in situ* is held to be incorrect, as in numerous cases the tannins of the plant by suitable treatment assume a tint in solution similar to that of the petals in the natural condition. Plants producing phloroglucinol-tannins yield original reds, those producing caffeotannin original blues only, and those producing gallotannin display vivid violets or purplish blues. The colour of yellow flowers is due to carotin or its diffused oxidation product, xanthophyll, and very rarely to a flavone. White flowers frequently enclose a very dilute solution of anthocyan, but the lack of colour is due chiefly to the circumstance that the nitrogen needed by

the reproductive organs has been fully supplied from sources other than the inflorescence.

—G. F. M.

Amino-azo compounds; Structure of — E. C. C. Baly and R. E. V. Hampson. *Chem. Soc. Trans.*, 1915, 197, 248—255.

THE azoid and quinonoid formulae put forward by Hantzsch (*Ber.*, 1909, 32, 2129) and Hewitt (*Chem. Soc. Trans.*, 1910, 97, 511) to account for the various colours of aminoazobenzene hydrochloride, its ammonium salt, and its solutions in concentrated sulphuric acid, do not account for all the facts, notably that merely 1% of hydrochloric acid or sulphuric acid brings about a colour change with both aminoazobenzene and its trimethylammonium salt. The authors prefer an explanation based upon Baly's molecular force field theory, the compounds having their closed field of force opened up by the action of the solvent, with the result that other light waves are absorbed, or in other words, a latent vibration period characteristic of the substance itself, and not of any hypothetical structural isomeride, is rendered active by the particular solvent employed. —G. F. M.

British manufacture of dyestuffs.

IN a letter published in the "Morning Post" of March 1st, Prof. H. E. ARMSTRONG says that he considers the situation almost hopeless, owing to the lamentable ignorance of our public men of matters scientific. Mr. Runciman has flouted English chemists. Thus, in his speech in Parliament he said, "When I think of the way in which some of our chemists have been literally bought up by foreign concerns, I am surprised that anyone should say that we have not an adequate supply of chemical knowledge." We have a right to demand the public withdrawal of that expression. If the production of dyes is to be taken in hand seriously and the foundation laid of a permanent industry, men must be chosen to manage the enterprise who are as able as was the late Dr. H. Caro, who played so great a part in the development of the Badische Anilin Company, or as his successor Professor Bernthsen is, or as is Professor Duisberg, who has brought the Bayer Company to its present proud position and now dominates the whole industry. We have in our ranks one or more men of their type who would be immediately available. But apparently the advisers of the Government want subordinate intellects, not leaders. If we had been serious, if we had been organised, we should have mobilised our chemical forces months ago to make dyes; the dozen really competent organic chemists in the country would have been picked out and their students enrolled under them as workmen. Meanwhile the situation is so serious that licences are being granted, it is said, to trade with the enemy in dyes. Our decadence comes from the fact that we have had no public use for science in our country and that we are blind both as to our needs and as to our opportunities. Our lack of courage and initiative is deplorable, and our individuality a serious hindrance. Our state of inefficiency is symptomatic of the state of the country. Government is in the hands of amateurs for the most part; only the special services are in expert hands, but their work is largely interfered with by an uninformed official class. And when we recognise that our Civil Service needs improvement, the Commission appointed to consider the question has only one representative of science among its members; the Royal Society, however, makes no protest. The worst feature in the Government attitude is that it will prevent the foundation of works—other than that to be established now under State

control—which in due season might compare favourably with the monumental factories in Germany; their scheme may help to tide over the immediate difficulty, but it is foredoomed to fail eventually, and our plight will then be worse than ever.

Sir WILLIAM RAMSAY, in a letter printed in the "Times" of March 10th, says that "British Dyes, Ltd." is foredoomed to failure for at least two reasons. First, it is not under the management of chemists. Scientific chemists must form an important part of the directorate. [He then proceeds to mention a number of chemical and metallurgical industries which owe their success largely to the fact that they were in the hands of competent chemists.] Unless "British Dyes, Ltd." copies this precedent, there is little hope for it. Second.—No "protection" from foreign competition will save the situation. The only measure is the total exclusion of German dyes. Even yet we are blind to methods of German commerce. German manufacturers, backed by the whole power of the German State (if at the end of the war there is a German State), will undersell our producers of dyestuffs, secure the whole market, and thus establish a monopoly. That has been their policy in the past; it will be their policy in the future. Let us be warned in time. There is ample chemical talent in this country, both scientific and technical. Every chemist is anxious to serve his country. What is needed is to call together a council of chemists, ask for their collaboration in investigation and for their advice. Also it should be announced that it is intended to exclude absolutely the importation of all German dyes, and capital will flow in. Any other policy is shortsighted. The German chemical industry is worked as a huge trust, backed by the whole power of the German State. The French and the Russians are seriously considering this policy of exclusion; and if Britain still permits imports, this will be the dumping-ground of all Germany's chemical products, until, competition being strangled, we shall have to pay exorbitantly for all manufactured articles imported.

In a letter published in the "Times" of the same date, Sir HENRY ROSCOE says that it is novelties that pay in all industries, especially in those dependent on fashion. For a new shade, or tint, or style, any price can be obtained. It is not the manufacture of the well-known colours which will bring financial and final success to the new English colour company. The preparation of these articles is on well-known lines. It is the new thing which makes a business success. Such things can only be accomplished by the research chemist, and yet, so far at least, this man is to have no voice in the direction of affairs in the new colour company, but merely to be called in as an expert when, in the opinion of his business superiors, he can help them to solve some difficulty. The Germans acted upon this confidence in the researcher from the beginning, and gave him a voice in the management. This is a pure matter of business. British chemists have preached the same doctrine for 30 years without much success. Now the crisis has come. Are we still to continue upon the old lines? Are we too proud to take a leaf—a golden leaf—out of the enemy's book? If we fail to do so, success is improbable, if not impossible. In the colour industry it is then the research chemist, and he alone, who can keep the flag flying, for he alone can bring forward new forces and create new developments. Capital cannot do it, business capacity cannot do it, but the brains, the imagination, the skill, and the knowledge of the research chemist can. We have the money and we have the men, but these must

be put into their right places to do their work efficiently.

Replying to a question in the House of Commons on March 8th, Mr. RUNCIMAN said that the new company invited applications for shares from users of dyes and colours and from others willing to assist in providing a supply thereof. In the case of the latter class of subscribers the question of taking dyes from the company did not arise, and no special class of stock was contemplated. No hard-and-fast rule was contemplated with regard to the scale of subscription which would entitle a participant to a supply of dyes. Cases in which firms dependent on a supply of dyes were *bona fide* unable to subscribe more than a limited amount of capital would be sympathetically dealt with on their merits.

In the House of Commons on March 11th, Mr. H. BOOTH called attention to the prospectus of "British Dyes, Ltd.," advertised in the "Times" of March 6th. This scheme was the illegitimate offspring of a Free Trade Government. Disappointed shareholders and complaining employees would arraign them for it later. The prospectus was vague and misleading to a degree. There was to be no compulsory sinking fund. That was simply an invitation to slack finance. The Government's money was to be confined to debentures. No company promoter had ever had the audacity to propose that before. This was not a prospectus at all. It simply indicated what—in its own phraseology—"may emerge in time and if circumstances justify." The committee to advise on new issues, he was told, had refused their consent to this issue. Had the Treasury or the Government overridden the committee?

Mr. PENNEFATHER said that the prospectus should have contained information as to the capital of Read Holliday and Sons and as to the salary to be paid to Mr. Holliday and Mr. Turner. He submitted a calculation from which he concluded that the company would be in financial stress from the moment it went to allotment.

Sir F. CAWLEY said that so far as he could gather, the only supporters of the scheme belonged to the Board of Trade. The Government ought not to use public money to force people in. If the scheme were successful, the Company would be a combine with all the worst features of an American trust. As regards the grant for research, the Government had no right to give public money to one company for its own profit.

Sir P. MAGNUS complained that the grant for research should be left entirely to a board of directors none of whom possessed scientific attainments. He saw no chance of the scheme retaining the industry in our own hands, or re-capturing it from German manufacturers. As soon as the war was over, the German companies would dump down their dyes in this country, and it would be impossible for the British company to compete on equal terms with their German rivals in the price at which they could be sold.

Sir ARTHUR MARKHAM said the Germans would smash this company unless the Government went on spending money for the scheme, and in a few years the Germans would still continue to monopolise the trade. The £100,000 for research work was wholly inadequate. All the money the country was now finding would be lost upon nothing but a wild-cat scheme.

Mr. HEWINS said the prospectus was an outrageous document to come from any public department of the country. He believed the potentialities of the country were sufficient to get out of the difficulty in regard to dyes if the manufacturers and chemists had been taken into consultation by the Government.

Mr. J. M. ROBERTSON (Parliamentary Secretary to the Board of Trade) said that Sir Algernon Firth had expressed the opinion that the option could be sold to-morrow at a profit. It had been said that there was no security that the firm would remain British, but no better security had been suggested. It had also been objected that there were no scientific men on the board of directors. He agreed that there was some force in the argument, but there was also force in the argument on the other side. He knew of many chemical concerns which had been ruined by having highly-gifted scientific men on their boards. When such men were on the boards the position of the other directors was often a difficult one. He did not think it was the function of the Board of Trade to attempt to decide such an issue as that. They first of all consulted the Council of Dye Users as to the general course of the scheme, and it was the Dye Users who practically selected the directors. The view was in favour of not putting chemical experts on the board on an equality with the other directors, but the Board, he believed, were still at liberty to reconsider the decision and to co-opt scientific men to the board. The Committee to advise the Treasury on new issues made no recommendation in this case on the ground that, as the policy of the new company had already been decided upon by the Government, it did not come within their scope. If the Government had adopted the plan of making the dyes themselves he was sure they would have been attacked for doing so. The payment of bounties on dyes would have offered no security for the production of the particular dyes needed. It had been stated that no one wanted the scheme, but to that the reply was that it had been introduced in consequence of the urgent demands of many persons interested in the industry. The scheme provided full supply of colours on the largest basis and to the largest number of units. He could not accept the prediction that the moment the war was over Germany would be able to renew the supply of dyes and that the trade would be conducted just as it had been before the outbreak of war. There was in Germany a school which had long recognised that to supply goods at "dumping" prices was to make a present to the purchasers, and if that school were in power the policy of refusing any dyes to this country might be adopted. To prohibit the importation of dyes from any foreign source would be utterly impracticable, and to prohibit importation from Germany alone would result simply in German producers setting up their works in Switzerland and sending supplies thence. It was impossible to pledge a future Parliament to prohibit the importation of dyes in time of peace. The objections which had been urged to the Government's scheme were mutually destructive, and the scheme was the only practicable plan which was before the country.

It is announced that the number of applicants for shares in British Dyes, Ltd., was 880, and the amount applied for £571,000, of which £83,000 was applied for conditionally; the directors did not feel justified in proceeding to allotment on such a subscription, and accordingly a meeting of subscribers was held at Manchester on March 24th to consider the position. There it was stated that, in round figures, £400,000 had been offered, excluding conditional subscriptions and those for which the board did not propose to allot. After some discussion, it was unanimously resolved to proceed with the company, the directors to consider the advisability of dropping the agreement with users. At the conclusion of the meeting, several of those present announced their intention of increasing the amount of their subscriptions.

Dyestuff manufacture in Russia. Board of Trade J., March 11, 1915.

A SYNDICATE has been organised for the purpose of forming a Russian company to establish works for the manufacture of dyes and chemical products from native raw material, and a large amount of capital has already been promised or subscribed. Some of the largest industrial concerns, especially around Moscow, are interested in the proposed undertaking, and such firms as the N. N. Konshin Co., the Danilov Manufacturing Co., the Tabner Company, the Tversk Manufacturing Co., and the Emil Zundel Manufacturing Co., are included in the syndicate. The plans are on a comprehensive scale, and will provide, *inter alia*, for the erection of special laboratories, under the direction of properly qualified professors and assistants, for experimenting with raw material.

PATENTS.

Triarylmethane dyestuffs; Preparation of——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 278,423, June 24, 1913.

THE ethanol derivatives of aromatic amines are condensed with aromatic aldehydes, and the resulting leuco compounds are oxidised or successively sulphonated and oxidised or oxidised and sulphonated. The products are yellower or greener and are faster to light both on the fibre and in the form of lakes than the corresponding dyestuffs from alkylated aromatic amines.—A. S.

Anthraquinone dyestuffs; Manufacture of——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 278,424, Jan. 7, 1913. Addition to Ger. Pat. 238,980 (this J., 1911, 1373).

1,1'-DIANTHRAQUINONYL-2,2'-BISARYL ketones or their derivatives are treated with condensing agents having a reducing action.—A. S.

Vat dyestuffs of the anthraquinone series; Manufacture of——. Kalle und Co. A.-G. Ger. Pat. 278,425, Sept. 29, 1912.

THE azo dyestuffs from diazotised α -aminoanthraquinone and a diamine of the benzene series, are condensed with aldehydes, e.g., benzaldehyde, to form monoaminotriazines, and the amino-group is then replaced by a hydrogen or other atom. The dyestuffs dye purer shades than the aminotriazines from which they are obtained.—A. S.

Monoazo dyestuffs; Preparation of mordant-dyeing——. Anilinfarben-u. Extrakt-Fabr. vorm. J. R. Geigy. Ger. Pat. 278,613, Nov. 11, 1913.

THE azo dyestuffs prepared from diazotised *o*-chloro-*m*-aminobenzoic acid and salicylic or cresotic acids are heated to a high temperature with alkaline substances, whereby the chlorine atom in the ortho position to the carboxyl group is replaced by hydroxyl. The shades produced on wool dyed in an acid bath and treated with chromium compounds are deeper than those produced by the original dyestuffs, and are fast to light, potting, and fulling. Some of the dyestuffs may be used in calico printing in the form of their chromium lakes.—A. S.

Vat [anthracene] dyestuffs; Manufacture of——. M. Kardos. Ger. Pat. 278,660, June 20, 1913. Addition to Ger. Pat. 275,220.

THE *N*-substituted derivatives of anthracene-1,9-dicarboxylic acid imine or its halogen substitution products are fused with alkali and the dyestuffs isolated as described in the chief patent (see this J., 1914, 827). The new products differ in shade

from those described previously. The dyestuff from anthracene-1,9-dicarboxylic acid methylimine, for example, produces considerably bluer tints than the dyestuffs described in the chief patent.—A. S.

Selenofluoresceins; Manufacture of—C. Jäger, G. m. b. H., and R. W. Carl. Ger. Pat. 279,549, May 18, 1913.

FLUORESCIN or a halogen derivative thereof is treated with selenium in alkaline solution. Good yields of selenium derivatives analogous to the thiofluoresceins (see this J., 1900, 1006) are obtained. The products appear to be of little value as dyestuffs, but should prove useful for therapeutic purposes.—A. S.

Azo dyestuffs. M. Herzberg, Leverkusen, Germany, Assignor to Synthetic Patents Co., New York. U.S. Pat. 1,126,466, Jan. 26, 1915. Date of appl., Feb. 25, 1914.

SEE Eng. Pat. 10,350 of 1913; this J., 1914, 545.

Azo dyes. H. Jordan and W. Neelmeier, Leverkusen, Germany, Assignor to Synthetic Patents Co., New York. U.S. Pat. 1,127,261, Feb. 2, 1915. Date of appl., Aug. 28, 1913.

SEE Addition of Oct. 2, 1913, to Fr. Pat. 457,840 of 1913; this J., 1914, 411.

Preparation of the products of oxidation of organic compounds. Ger. Pat. 277,733. See III.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Oxycellulose. W. D. Bancroft and R. H. Currie, jun. J. Phys. Chem., 1915, 19, 159—168.

OXYCELLULOSE is always the same product in a qualitative sense, whether prepared by the action of nitric acid, permanganate, chloric acid, bleaching powder, or bleaching powder and air. The authors have not succeeded in converting the whole of the cellulose into oxycellulose in a single operation, and it is doubtful whether pure oxycellulose has ever been prepared. Oxycellulose is partially soluble in dilute alkali hydroxides, with a yellow colour on heating; the residue is simply unoxidised cellulose in varying proportions. The dissolved substance is precipitated by alcohol or acid and after dialysis it is readily soluble in water. This soluble substance is regarded as the true oxycellulose and may be a homogeneous substance. The distinction made by Nastjukoff (this J., 1901, 573) between α -, β -, and γ -oxycelluloses does not exist. So-called α -oxycellulose is unattacked cellulose, more or less contaminated with products of decomposition; β - (alkali-soluble) and γ - (water-soluble) oxycelluloses are the same substance in different states of aggregation. The cupre-reducing property of oxycellulose is probably not characteristic and may be due to the presence of other decomposition products: this property readily disappears on prolonged heating without any essential change in the other characteristics of the oxycellulose.—J. F. B.

Viscose; Determination of the "ripeness" of—V. Hottenroth. Chem.-Zeit., 1915, 39, 119—121.

THE xanthogenic ester of cellulose, in solution as viscose, undergoes dissociation or hydrolysis on storage, with ultimate reversion to cellulose. The progress of this reaction is termed "ripening" and is usually measured by differential titrations

with iodine after the addition of hydrochloric acid to one portion and of acetic acid to another. The difference represents the alkali combined as xanthate in the compound, XO.CS.SNa , and is proportional to the degree of esterification at any given stage. Since the determination of this factor in works' practice is not of the simplest order, and since the industrial importance of "ripeness" relates almost solely to the speed of coagulation of the viscose, the author has devised a rapid method of titration based on direct coagulation with 5% acetic acid or preferably with 10% ammonium chloride or sulphate solution: 20 grms. of the viscose is diluted with 30 c.c. of water and titrated with 10% ammonium chloride at a standard temperature until coagulation takes place. The method is entirely empirical and the best proportions of water and viscose may be selected according to the alkalinity of the viscose, percentage of cellulose, and saline by-products. The ammonium salt is preferable to acetic acid as the coagulating agent, being less affected by small accidental variations in the amount of caustic alkali present. Similarly, the interpretation of the titration results must also be founded on empirical observations to determine the optimum condition of "ripeness" for practical working.—J. F. B.

Celluloid; Influence of the addition of zinc oxide on the quality of—H. Nishida. Caout. et Guttaparcha, 1915, 12, 8576—8577, 8592—8593.

A COMPARISON was made of various physical properties and of the stability of a pure, transparent celluloid, consisting of a mixture of nitro-cellulose prepared from bleached rags, with 30% of camphor "A" (Japanese Govt.'s designation)—with those of mixtures, in proportions varying from 0.5 to 15% of zinc oxide and the same celluloid. Before measurement, the samples were all dried until they contained the same quantity of volatile substances. It was found that the cubical contraction of the samples during drying diminished as the percentage of zinc oxide increased; that the equation connecting the density of the two components with that of the mixture, was that of a straight line; that the tensile strength and the modulus of elasticity fell—the latter very rapidly—with an increase in the content of zinc oxide; that the hardness of a mixture containing 15% ZnO was only half that of the pure celluloid; that the stability, as measured by the Abel heat test, was reduced by the addition of zinc oxide, although the temperature of decomposition was not affected materially; and that the specific electrical resistance fell from 122.5 in the case of the pure celluloid to 28.3 in the case of the mixture containing 15% ZnO .—E. W. L.

Sulphate- and sulphite-cellulose waste lyes; Investigations on the utilisation of—E. L. Rinnan. Ver. Zellstoff- u. Papierchem., Dec. 5, 1914. Chem.-Zeit., 1915, 39, 99.

OF the methods developed by the author, that for the recovery of soda from the waste lyes of the sulphate process, based on a modification of the ammonia-soda process, with production of acetates, formates, acetone, and oils as by-products (this J., 1912, 183), has not proved suitable on the large scale. The alternative method is more practicable. The dilute alkaline black-lyes are treated with recovered soda ash equivalent to the quantity of Na_2O present in them, and the mixture is causticised with lime. The filtrate is concentrated to 40° B. (sp. gr. 1.383) and treated with slaked lime in the proportion of 3—4 mols. also calculated on the original Na_2O . The mass is then submitted to destructive distillation in presence of a sufficient quantity of steam, which

if the process be conducted in tunnel kilns with continuous operation, is supplied by the moisture in the mass. The combustible gases produced are utilised for heating the kilns, while 100—125 kilos. of acetone spirit per ton of cellulose, as well as light and heavy oils, are collected; the residue consists of sodium carbonate, lime, and charcoal. The method devised for the treatment of waste sulphite lyes is based on the fact that when the lye is treated first at a low temperature and subsequently at 175°—180° C. with a sufficient quantity of lime, calcium sulphite is precipitated and the organic matters are transformed into the same condition as that in which they exist in soda-cellulose lyes, and are susceptible to analogous treatment. The crude lye is neutralised and concentrated, then boiled with lime, and the precipitate of calcium sulphite and humic substances removed. The calcium sulphite is used for the preparation of fresh bisulphite lye by lixiviation with aqueous sulphurous acid. The alkaline filtrate is concentrated to 40° B. (sp. gr. 1.383), mixed with 1.5 mol. of milk of lime and submitted to destructive distillation. From 5 cb. m. of sulphite lye (=1 ton of cellulose) there are obtained: 125 kilos. of calcium sulphite, 250 of humic substances, 19.5 of acetone spirit, 15 of light oils, and 10 of heavy oils. If sawdust be added when boiling the lye with lime, filtration is considerably facilitated and the yield of distillation products increased.—J. F. B.

Sulphite-cellulose waste lyes; Utilisation of —, especially for the manufacture of alcohol. H. B. Landmark. Chem.-Zeit., 1915, 39, 98—99.

ONE cb. m. of sulphite waste lye requires 11—13 kilos. of CaO for complete neutralisation; it is therefore more economical to expel most of the sulphur dioxide by aeration in a trickling-tower. In Norway the lye is evaporated partially before neutralisation and only 2—3 kilos. of CaO is then required. The yeast is first cultivated in a malt mash to which sulphite lye is subsequently added in increasing quantities. After 5—6 days the yeast can be used for pitching the main body of lye. The addition of a little milk or whey is very favourable to the fermentation, and a product known as "lignocasein" is then obtained, consisting of a yellow powder containing 65% of casein, which can be used as a size. The liquid containing the sugars is evaporated at 50° C. to a syrup and fermented at 26°—28° C. with waste brewery yeast; the yield is about 88 litres of spirit per ton of cellulose, at a cost of 8.5 öre (about 1.1d.) per litre of absolute alcohol. Fermentation lasts for 4—5 days. The spent wash is evaporated for the production of "cell-pitch" for use as a fuel or binding agent for briquettes; the calorific value of the cell-pitch from one ton of waste lyes is equivalent to that of 372 kilos. of carbon. The author prefers the fermentation process to Strehlenert's method (this J., 1913, 652) which is attended by certain engineering difficulties, but the lignin from the spent wash may be submitted to destructive distillation. The alcohol from sulphite lyes is suitable for all industrial purposes, including generation of motive power; Simonsen has recently proposed a petroleum distillate as a denaturing agent, which increases the calorific value of the spirit by 300 cals.—J. F. B.

Paper mill effluents; Purification of —. G. B. Kershaw. Paper Making, 1915, 34, 50—51.

THE average volume of water consumed in paper mills is estimated at 50,000 galls. per ton of paper made, but with fine white papers it may be as much as 200,000 galls. Whenever possible, the alkaline liquors from the digesters are evaporated for the recovery of the soda, but in cases where

a certain amount of dilute spent lye has to be disposed of, it should be stored and allowed to mix uniformly and gradually with the other waste waters from the mill. Suspended solids are deposited in large settling tanks, sometimes with the assistance of added chemicals, such as "aluminoferric." The solids in solution, apart from those in the digester lyes, are generally small in quantity and unobjectionable; if the effluent from the settling tanks contain not more than 5—7 parts of suspended matter per 100,000, the purification may be considered satisfactory. Sometimes the waste waters are strained through fine material in addition to the tank treatment. The disposal of the sludge is a great difficulty on account of the large quantities produced and the difficulty of drying. Occasionally the sludge is pressed, but generally it is allowed to dry in well-drained lagoons, since it is not of a noxious nature. The question of utilising portions of the waste solid matters depends on the design of the drainage system, so that the waste waters containing useful fibres can be treated separately from the general wastes. In many mills large quantities of lime and calcium carbonate sludge are produced, which have a certain agricultural value but are difficult to handle in the moist state.—J. F. B.

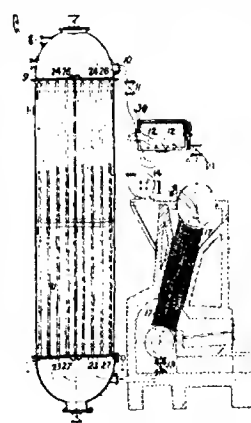
PATENTS.

Warp; Apparatus adapted for drying —. W. Yates, and Matthews and Yates, Ltd., Swinton, Lancs. Eng. Pat. 3747, Feb. 13, 1914.

THE warp is led through a casing in approximately parallel vertical courses, and hot air is directed transversely upon it from perforated horizontal pipes in the intermediate spaces. A fan withdraws air from the warp inlet or outlet side of the casing, and forces it through a heater back to the drying chamber. Vertical steam pipes may also be placed within the casing to heat the entering air, and exercise a drying effect by radiation upon the warp.—B. N.

Digester for the soda-, sulphate-, and sulphite-cellulose processes; Vertical —. H. A. Knopf. Ger. Pat. 275,035, July 5, 1913.

THE digester consists of a tall, upright vessel provided with upper and lower pairs of hinged



of the digester, and then up through the tubes, 21. With the upright form of digester, it is possible to use vessels of up to 500 cb. m. capacity and to obtain by the soda process, pulp of a lighter colour than sulphite pulp.—A. S.

Wool scouring and like liquors; Concentration of — and the recovery of grease and alkaline substances therefrom. E. V. Chambers, T. C. Hammond, and G. G. Jarman, Huddersfield. Eng. Pat. 13,005, May 27, 1914.

THE liquor is heated to about 200° F. (93° C.), and then subjected to centrifugal action to separate grease and sand. The clear liquor obtained is used repeatedly for scouring until, through accumulation of alkali salts, it is concentrated to a density unsuitable for scouring purposes. It may then be further concentrated by means of washed flue gases, and the salts recovered by incineration.—B. N.

Best fibre such as flax or hemp; Preparing — for spinning. B. S. Summers, Port Huron, Mich., Assignor to Summers Linen Co. U.S. Pat. 1,127,311, Feb. 2, 1915. Date of appl. June 12, 1911.

THE fibres are prepared and retted by treatment with an alkali and a solution of a nitrogenous animal product, such as decomposed casein.—B. N.

Wood-pulp boilers with indirect heating; Process for removing the deposit which forms on the heating surface of —. E. Morterud. Ger. Pat. 278,827. Aug. 13, 1913.

AFTER emptying the boiler, steam and cold water are passed successively through the heating tubes, whereby the deposit is first dried and rendered brittle, and then, when suddenly cooled, cracks and breaks away.—A. S.

Lignocelluloses, such as wood, mechanical wood pulp, straw, or the like; Treatment of —. C. Melhardt. Ger. Pat. 279,102, May 16, 1913.

THE material is subjected to a "natural bleach" or lixiviated with lime water to remove the non-resinous constituents of the incrusting substances and then the resinous constituents are removed by treatment with alkali. A considerably smaller quantity of alkali is required to remove the resin if the non-resinous constituents be removed first as described.—A. S.

Wood; Bleaching of —. A. Franck-Philpison, Jackson, Mich., U.S.A. Eng. Pat. 3407, Feb. 10, 1914. Under Int. Conv., Feb. 17, 1913.

SEE U.S. Pat. 1,068,580 of 1913; this J., 1913, 978.

Formic esters used as solvents of cellulose compounds; Recovery of —. J. Duclaux, Paris. U.S. Pat. 1,127,871, Feb. 9, 1915. Date of appl. Jan. 31, 1913.

SEE Fr. Pat. 439,721 of 1912; this J., 1912, 711.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Dyeing; Theory of —. F. W. D. Bancroft. J. Phys. Chem., 1915, 19, 145—158.

THE fastness to washing of the various dyestuffs on the fibre depends on the completeness with which the dye-bath is exhausted. If the bath has been exhausted completely, the dyed fabric will not bleed in any liquid having a weaker solvent action than the exhausted bath. If the bath is not to be exhausted completely, the goods must be removed when the shade is that which would be in equilibrium with an exhausted bath, or else the bath must be arranged so that it has a high stripping power and will only dye to the shade which is

in equilibrium with boiling water. The adsorption of dyestuff is not always greater at higher temperatures, and the main object in heating the bath is to coagulate or agglomerate the dyestuff in the fibre, thereby making it less soluble; the steaming of mordant-dyed goods has a similar effect upon the colour-lake. If a mordant is precipitated too rapidly it will be deposited largely on the outside of the fibre and the dyed goods will not be fast to rubbing and soaping. Certain colour-lakes may change their physical condition with time and become friable and less strongly adsorbed by the fibre than when freshly dyed. As regards fastness to light, only light which is absorbed can produce chemical action, and the fading depends on the readiness with which the substance reacts or on the presence of suitable depolarisers. As a rule, dyestuffs combined with mordants are faster than the same dyestuffs used alone. Many dyes are faster to light when combined with iron, chromium, or copper mordants than with aluminium or tin; this may be due to the absorption of certain rays by the coloured mordants, as, for instance, in the case of the protective action of copper mordant with blue substantive dyestuffs on cotton.

—J. F. B.

Coppered blues; Fastness of direct —. A. Edge. J. Soc. Dyers and Col., 1915, 31, 75—76.

IN addition to increasing the fastness to light, the "coppering" of direct blues gives a marked improvement in the resistance to neutral soaping. The fastness to light of "coppered" blues is generally decreased by washing with soap and soda, a notable exception being Benzoazurin G, which becomes redder but loses little, if any, of its fastness to light. This is due to the fact that this dyestuff forms a copper lake much less susceptible to alkali than that of any of the other blues suitable for after-treatment with copper salts. The injurious effect of an oleine finish on "coppered" blues is obviated if dextrin is present: a pattern finished with a solution containing 10 parts of dextrin and 5 parts of oleine per 100 was found to be considerably faster than the unfinished shade.

—F. W. A.

Dyeing and bleaching of some commercial fibres. S. G. Bailey. J. Soc. Dyers and Col., 1915, 31, 46—50.

BAHIA fibre is the most important brushmaking material, the cheaper African bass coming next. The former is used in its natural brown colour, and African bass is dyed to imitate it. Acid dyestuffs have no affinity for this fibre, easy levelling basic and direct dyestuffs being used. The fibre, tied in bundles, is packed in a tank to hold 6 cwt., 3 lb. of a basic dye being used and in addition 3 lb. of ferrous sulphate, which deepens the shade and makes it faster to rubbing. The bath is boiled for four to five hours. When direct dyestuffs are used, the ferrous sulphate is replaced by sodium carbonate. Direct dyestuffs are not taken up completely from the baths and standing baths are therefore used. Bassine fibre is resistant to dyestuffs. It is dyed only with basic dyestuffs, and usually to the shade of African bass, for which it is a cheaper substitute. It is also dyed black with logwood, but the dearer basic blacks give a better shade. No heat is used in drying. Mexican fibre is usually dyed black with direct or basic dyestuffs. It has no affinity for acid blacks, though other acid colours can be dyed. Direct colours are dyed with soda in a standing bath. The fibre is taken from the dye-tank without washing and dried over warm pipes. Bright shades are often dyed and these necessitate bleaching, which is carried out by boiling with 5% of oxalic acid and a trace of acetic acid.

Acid dyestuffs are used in a sulphuric acid bath. Coconut fibre or coir is dyed in all shades. For brushes it is dyed black with basic dyestuffs, for which, however, it has a poor affinity. For mat making various shades are obtained with acid dyestuffs, by dyeing for a very short period in a bath containing 8 oz. of sodium sulphate and 8 oz. of alum per 10 galls. of liquor; standing baths are used. For heavy shades basic and substantive dyestuffs are mostly used. Kitool fibre is always dyed black, using a basic dyestuff, as it has no affinity for acid or substantive colours. It is used chiefly in Germany and mainly for making brushes for turbines and big guns. For the latter purpose it is not dyed but is treated with mineral oil, which gives it a jet black colour after a few hours' immersion. Esparto grass, when used in brush-making, for which it has little value, is dyed brown with basic dyestuffs and mixed with African bass. Horsehair is bleached by means of peroxide and sulphur stoving, and dyed with acid dyestuffs.—J. B.

Indigo vat; Theory of dyeing with the—
M. H. Marbe. Rev. Gén. Mat. Col., 1914, 18, 263—272.

EXAMINATION of the physico-chemical properties of the indigo vat by means of dialysis, the ultramicroscope, and electrolysis, indicates that the calcium and sodium salts of indigo-white exist in the vat partly ionised and partly in the colloidal state. The ionisation is increased by diminishing the concentration and by raising the temperature. The proportion in the colloidal state increases with the concentration and diminishes with rise of temperature. All other conditions being equal, the calcium salt of indigo-white is ionised to a greater extent than the sodium salt. Dyeing trials showed that on cotton indigo is less fast than on wool, the dyeings on linen being faster than either. A portion of the indigo fixed on cotton is faster than the remainder, and it is concluded that this faster portion comes from the ionised indigo-white salt. The remainder, being deposited mechanically from the colloidal portion of the indigo-white salt, is less intimately associated with the fibre and therefore less fast. The mechanism of the dyeing process is elucidated with the aid of Perrin's theory of the precipitation of colloids. The dissociated portion of the indigo vat gives an inorganic ion of positive charge and of low molecular weight, and an organic ion of high molecular weight. The smaller inorganic ion approaches the surface of the fibre more quickly and gives it a positive charge. The fibre thus charged attracts the organic ion and the dyestuff is thereby fixed. The fact that the inorganic ion in the calcium salt of indigo-white is bivalent, and therefore more strongly charged, explains why a lime vat dyes better than a sodium vat. The retarding effect of an excess of sodium or calcium hydroxide in the vat is in agreement with this explanation, the hydroxyl ions thus introduced having a stronger negative charge than the positive charge of the sodium or calcium ions, so that the fibre is charged negatively and repels the negatively charged dyestuff ion. The author gives a lengthy historical review of previous work on the subject.—J. B.

PATENTS.

[Sulphide] dyestuffs; *Application of*—
E. Lodge and J. M. Evans, Huddersfield. Eng. Pat. 19,473, Sept. 3, 1914.

ANIMAL fibres (including furs and feathers), union goods, and artificial silk, are dyed with sulphide dyestuffs reduced by an alkali sulphide in the presence of an alkali sulphite and a neutral ammonium salt.—B. N.

Dyeing furs, hairs, feathers, and the like; Process for—
Act.-Ges. f. Anilinfabr. Ger. Pat. 277,496, Oct. 21, 1913.

THE material, mordanted or not, is dyed with a solution containing 3-aminocarbazole or a derivative thereof and an oxidising agent. Grey shades are produced.—A. S.

Oxidation-colours on vegetable or animal fibres; Production of fast—
Farbw. vorm. Meister, Lucius, und Brünig. Ger. Pat. 277,310, March 29, 1913.

THE material is prepared with an oxidising agent, printed by the machines used in lithographic or typographic printing with a paste composed of "varnish" and bases of the benzene, naphthalene, or diphenylamine series which are readily oxidised to dyestuffs, and the colour then developed by steaming.—A. S.

[Azo] dyestuffs on the fibre; *Process of producing*—
by means of the one-bath method. F. Kunert and P. Acker, Offenbach, Assignors to Chem. Fabr. Griesheim-Elektron, Frankfurt, Germany. U.S. Pat. 1,127,027, Feb. 2, 1915. Date of appl., Apr. 17, 1914.

SEE Fr. Pat. 471,123 of 1914; this J., 1915, 174.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Nitric acid; The boiling point of aqueous solutions of—
at different pressures. Part I. H. J. M. Creighton and J. H. Githens. J. Franklin Inst., 1915, 179, 161—169.

THE boiling points of mixtures of chemically pure 99.79% nitric acid and water were determined at atmospheric, 360 mm., 250 mm., and 110 mm. pressure. Isobaric curves showing the change in the boiling point with variation in the composition are given; they are approximately parallel, and their shape is that characteristic of mixtures exhibiting a maximum boiling point. The boiling point of the pure acid was found to be 82.5° C. at 675 mm., and the highest boiling point was obtained with a mixture containing 69.24% HNO₃ (121.8° C. at 760 mm.). Determinations were also made of the boiling point and composition of the mixture of maximum boiling point at 760, 360, and 110 mm. pressure, 500 c.c. of mixtures with 60 to 80% of nitric acid being distilled until only 15 to 20 c.c. remained, and the acid content of the residue determined with standard barium hydroxide. The results confirmed the evidence given by the earlier experiments that the composition of the mixtures of maximum boiling point changes but slightly with the pressure. The mean results obtained, in good agreement with those recorded by Roscoe (J. Chem. Soc., 1861, 13, 146), were:—at 760 mm., 66.18% HNO₃, b.pt. 121.70° C.; at 360 mm., 67.15% HNO₃, b. pt. 99.9° C.; at 110 mm., 66.80% HNO₃, b.pt. 74.2° C.—T. St.

Sulphurous acid; Volumetric determination of free—
A. Sander. Chem.-Zeit., 1914, 38, 1057—1058.

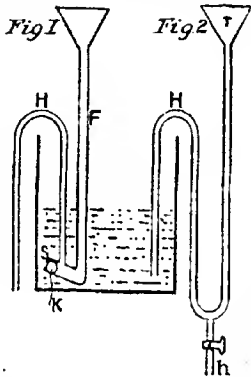
IN sulphurous acid solutions which contain other substances capable of absorbing iodine, the former may be titrated with sodium hydroxide solution using methyl orange as indicator; phenolphthalein cannot be used (see also this J., 1914, 615; 1915, 225). The sulphuric acid resulting from the oxidation of sulphurous acid by hydrogen peroxide may also be titrated in the same manner. When sodium bisulphite is treated with mercuric chloride before titration, 1 mol. of SO₂ requires 2 mols. of

NaOH, as the hydrochloric acid, liberated according to the equation: $\text{NaHSO}_3 + \text{HgCl}_2 = \text{NaSO}_3 + \text{HgCl} + \text{HCl}$, is also titrated. For the determination of sulphurous acid in the presence of sulphuric acid, the author prefers a method described previously by himself (this J., 1914, 442).—W. P. S.

Acid siphons. W. Szigeti. Chem.-Zeit., 1915, 39, 122.

Two patterns of acid-siphons constructed entirely of metal (lead or aluminium) are illustrated. Both are started by pouring some of the acid into the funnel at the top.

In Fig. 1 the vertical charging tube, F, is of larger bore than the siphon proper and is bent at an angle at the bottom terminating in a hole, S, constricted to the size of the siphon tube, H. When liquid is poured quickly into the funnel, a larger quantity passes down the tube, F, than can flow through the hole, S, and the excess rises in the tube, H, starting the siphon. A glass ball may be placed in the short branch to act as a check-valve in the hole, S, during starting, falling back again when the siphon starts. Fig. 2 shows a pattern constructed of aluminium for nitric acid, with a tap, h, for intermittent use without recharging.—J. F. B.



Lactic acid; Analysis of —. T. A. Faust, J. Amer. Leather Chem. Assoc., 1915, 10, 73—78.

TOTAL free acid is satisfactorily determined by titrating the diluted acid with N/10 or N/5 alkali, using phenolphthalein as indicator. Lactones and anhydrides are estimated by adding excess of alkali, heating on the water bath for 10 or 15 minutes, and titrating back with acid; the additional alkali used corresponds to lactones, etc. The methods at present used for the determination of volatile acid do not give concordant results. When the amount present is not more than 3%, it may be determined with sufficient accuracy by a single distillation, and titration of the distillate. With higher contents of volatile acid, Small's method should be used, 100 c.c. of the diluted acid being distilled to 10 c.c., the residue made up to 100 c.c. and again distilled as before, the two distillates combined, diluted to 200 c.c., distilled, and the final distillate titrated.—F. C. T.

Carbonic acid; Reduction of — [to formic acid]. G. Bredig and S. R. Carter. Chem.-Zeit., 1915, 39, 72—73.

CONSIDERABLE amounts of free formic acid are obtained by the action of hydrogen and palladium-black under pressure on carbon dioxide in presence of water, whilst formic acid is decomposed catalytically into carbon dioxide and hydrogen. The determination of the equilibrium between these reactions between 30° and 90° C. gave no indication of the formation of formaldehyde as an intermediate product, so that it is unlikely that the formation of formaldehyde is a stage in the assimilation of carbonic acid in nature.—T. C.

Boric acid; Determination of small quantities of —. G. Halphen. Ann. Falsif., 1915, 8, 1—2.

A MODIFICATION of Bertrand and Agulhon's method (this J., 1914, 105). The boric acid is separated as methyl borate, which is received in 0.2 c.c. of N/1 sodium hydroxide solution; the alkaline solution is evaporated to dryness in a small test-tube and the residue dissolved in 1 c.c. of water and 2 c.c. of hydrochloric acid (sp. gr. 1.162). Comparison solutions are prepared at the same time, containing definite, successively increasing quantities of boric acid. To each of the tubes is added 1 c.c. of a solution of turmeric in ethyl acetate, and the red colorations which develop are compared after the lapse of 50 minutes.—W. P. S.

Boric acid method [for determining ammonia]; Further applications of the —. [Determination of the purity of lithium carbonate and basic magnesium carbonate.] L. W. Winkler. Z. angew. Chem., 1915, 28, 48.

THE method previously described (see this J., 1915, 79) may also be applied to the direct determination of aliphatic amines such as methylamine and trimethylamine, and to ascertaining the degree of purity of pharmaceutical preparations of lithium carbonate and basic magnesium carbonate: 0.1220 gm. of lithium carbonate, dried at 160°—180° C., is added to a mixture of 1 gm. of boric acid and 10 c.c. of water, carbon dioxide is boiled off, and the cooled solution (titrated with N/10 hydrochloric acid, using methyl orange (1:1000) as indicator. A burette reading of 33.03 c.c. corresponds to 100% Li_2CO_3 , while in mixtures of lithium and sodium carbonates every diminution of 0.1 c.c. corresponds to a content of 1.0% Na_2CO_3 . In the case of basic magnesium carbonate, 0.1 gm. is treated similarly with 2 grms. of boric acid and 20 c.c. of water. In determining the alkalinity of natural waters containing much carbonic acid, a very sharp end-point is obtained by boiling the water (100 c.c.) for a few minutes with pure boric acid (1 to 2 grms.) and titrating the cold liquid with N/10 hydrochloric acid, using methyl orange (2 drops only) as indicator. Cold solutions of atropine and codeine in aqueous boric acid likewise give sharp end-points, but other alkaloids, e.g. quinine, cannot be determined in this way.—J. R.

Ammonia; Heat of formation and specific heat of —. F. Haber. Deuts. Physik. Ges., Nov. 6, 1911. Chem.-Zeit., 1915, 39, 24.

THE heat of formation and specific heat of ammonia were determined with the following results:—

| Heat of formation. | | | Specific heat. | | |
|--------------------|-------------|--------|----------------|-------------|--------|
| °C. | calculated. | found. | °C. | calculated. | found. |
| 0 | 10,950 | 10,950 | 200 | 10.2 | 10.3 |
| 466 | 12,840 | 12,970 | 422 | 11.0 | 11.4 |
| 593 | 12,940 | 12,700 | 523 | 11.86 | 11.8 |
| 554 | 13,083 | 12,900 | | | |
| 659 | 13,253 | 13,150 | | | |

—J. R.

Wood charcoal filter for the waste gases from [ammonium] sulphate plant. Reinhard. J. Gasbeleucht., Feb. 6, 1915. J. Gas Lighting, 1915, 129, 450—457.

THE waste gases from the manufacture of ammonium sulphate from gas liquor, etc., can be rendered innocuous before their discharge into the air, by passing them through coolers, thence through iron oxide purifiers, and finally through iron pipes packed with wood charcoal. The last-named device is substituted for combustion which

has hitherto been demanded by the Government Factory Department of Saxony.—E. R. A.

Bromides; Detection of—*in the presence of thiocyanates, cyanides, and ferrocyanides.* L. J. Curtman and A. G. Wikoff. *J. Amer. Chem. Soc.*, 1915, 37, 298—301.

THIOCYANATES, cyanides, and ferrocyanides interfere with the test for bromide even when excess of chlorine-water is employed. The neutral or slightly acid (with sulphuric acid) solution (containing, e.g., 500 mgrms. of any one of the above radicals) is heated just to boiling with saturated sulphur dioxide solution (15 c.c.), and treated while hot with 2-N copper sulphate solution, which is run in until the supernatant liquid becomes blue. A greenish liquid in the presence of thiocyanate indicates insufficient addition of sulphur dioxide. The hot filtered solution and washings are concentrated to 5–10 c.c. in a conical flask, washed into a test-tube, and shaken with 1 c.c. of 3-N sulphuric acid and 1 c.c. of 1% potassium permanganate; 0.5 c.c. of carbon bisulphide is then added and the mixture again shaken: a yellow colour in the carbon bisulphide layer indicates presence of bromide. Quantities of 2 mgrms. of bromine were thus detected in the presence of 500 mgrms. of the pure or mixed interfering radicals. The range of the above interference was estimated for each radical.—J. R.

Water, potassium iodide, and iodine; A study of the system—*at zero degrees.* G. Jones and M. L. Hartmann. *J. Amer. Chem. Soc.*, 1915, 37, 241—258.

The solubility of iodine in pure water at 0° C. was found to be 0.0006383 gm.-mol. per litre: this value includes 3.2×10^{-5} mols. in the form HIO , 1, and I_2 , leaving 0.0006380 mol. of I_2 dissolved per litre. At 25° C. there is apparently a very slight tendency (equivalent to about 0.04 volt) for oxygen to be liberated from the solution. The hydrolysis constant of iodine in water at 0° C. is given as 9×10^{-15} . The iodine was titrated according to the method of Washburn (*J. Amer. Chem. Soc.*, 1908, 30, 31), with 0.15-N and 0.007-N solutions of sodium arsenite containing large amounts of monosodium and disodium phosphates, the weaker solution being used towards the end of the titration. When a very faint yellow tint was reached the solution was shaken violently with 5 c.c. of pure benzene, and the arsenite solution added drop by drop until the pink colour of the benzene layer disappeared on shaking. Data are given for the solubility at 0° C. of iodine in aqueous solutions of potassium iodide of strengths between $N/10$ and $N/1000$, also for the conductivity of the solutions before and after saturation with iodine. The figures obtained for solubility were (approximately) $N/10$, 1.2%; $N/20$, 0.6; $N/50$, 0.25; $N/100$, 0.14; $N/1000$, 0.03% by weight.—J. R.

Fluorspar; Cause of the phosphorescence of—R. Formals. *Chem.-Zeit.*, 1914, 38, 1111.

The phosphorescence of certain varieties of fluorspar is probably due to the oxidation of traces of finely divided arsenic sulphide. Ignited fluorspar does not show the phenomenon. The addition of a trace of arsenic sulphide to powdered fluorspar causes phosphorescence on heating.

—C. A. M.

Strontium sulphate; Solubility of—*in solutions of calcium salts.* M. Raffo and G. Rossi. *Gaz. Chim. Ital.*, 1915, 45, I., 45—50.

A mixture of strontium nitrate and calcium nitrate solutions was treated with a solution containing the quantity of calcium sulphate required theoretically to convert the strontium into sulphate; after standing for 24 hours, the mixture

was heated at 60° C. for 15 mins., allowed to cool slowly, and the precipitated strontium sulphate collected and weighed. The quantity of strontium in solution was then calculated and also the total quantity of calcium nitrate, including that from the decomposition of the strontium nitrate. According to this method, a 0.5% solution of calcium nitrate dissolved 0.018 gm. of strontium sulphate per 100 c.c.; a 1% solution dissolved 0.062 gm.; 2%, 0.108 gm.; 3%, 0.128 gm.; 4%, 0.149 gm.; 5%, 0.170 gm.; and 6%, 0.196 gm. of strontium sulphate per 100 c.c. Calcium salts appear to have no effect on the solubility of barium sulphate.—A. S.

Nickel and cobalt with cyanogen; Complex ions of—G. Rossi. *Gaz. Chim. Ital.*, 1915, 45, I., 6—10.

The results of determinations of the electrical conductivity of solutions of nickel and cobalt chlorides to which increasing quantities of potassium cyanide were added, indicate that the double salts formed in the respective cases are $\text{K}_2\text{Ni}(\text{CN})_4$ and $\text{K}_2\text{Co}(\text{CN})_6$.—A. S.

Silicate liquids; Crystallisation in—N. L. Bowen. *Amer. J. Sci.*, 1915, 39, 175—191.

EXPERIMENTS were made to determine whether crystals sink in a fluid rock magma. A crucible containing an artificial mixture having the composition of a pyroxene, viz., diopside 56, and MgSiO_3 44%, was held in an electric furnace at 1430° C. for a definite period, and then suddenly cooled. Small olivine crystals separated and increased in number towards the bottom of the crucible as the duration of heating was increased, while the upper part of the chilled melt consisted of a clear glass. Definite sinking of pyroxene crystals was also observed in mixtures of greater viscosity, containing an excess of silica over the pyroxene composition. In mixtures containing a still larger proportion of silica, the rising of specifically light crystals was shown by the accumulation of tridymite crystals in the top layer of liquid. Convection currents apparently do not affect materially the sinking of the crystals; hence from the rate of sinking a rough estimate of the viscosity of the fluid mixture can be made; the viscosity increases with the silica content. The application of the experimental results to the problem of the variations in the composition of igneous rocks is discussed.—W. C. H.

Rare-earth compounds; Contribution to the photochemistry of—A. Benrath. *Chem.-Zeit.*, 1915, 39, 25.

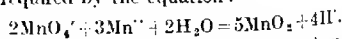
COMPOUNDS of numerous rare-earth elements, when associated with oxalic acid, hydroxy-acids, or alcohols, are reduced in presence of light. Thallic bromide is reduced progressively to TlBr_2 , TlBr , TlBr_3 , 3TlBr , TlBr , and Ti ; thallic chloride is converted successively to thallium sesquichloride, thallous chloride, and thallium; ceric salts oxidise even benzoic acid and fatty acids; derivatives of titanous acid are reduced to titanous and titanous salts. Similarly, oxalic acid in presence of light liberates free tellurium, selenium, and sulphur, respectively, from solutions of telluric, tellurous, selenic, selenous, and sulphurous acids. Molybdates and tungstates react more feebly than chromates. Iridium ammonium chloride is reduced to iridous chloride.—J. R.

Radium; New methods of extraction of—*from uranium minerals.* E. Ebler and W. Bender. *Z. angew. Chem.*, 1915, 28, 25—40, 41—48.

A FULL review of the sources of radium and the methods applied in its extraction is given. Radium minerals always contain uranium and frequently vanadium and thorium. Joachimsthal pitchblende is practically free from thorium, and the

radium prepared from it consequently contains no mesothorium. The amount of pitchblende obtained from Joachimsthal varies from 10 to 20 metric tons per annum, corresponding to 1.7 to 3.5 grms. of radium. The cost of high-grade blende (50% U) is about M. 100 per kilo. (about £2 5s. per lb.). Pure carnotite (potassium uranyl vanadate) contains from 52% to 57% U, but the richest commercial ores contain only 6–7% U, and specimens are worked which contain as little as 0.5% U. The ratio Ra : U is practically constant, and, as in the case of pitchblende, amounts to about $3.33 \times 10^{-7} : 1$. In 1913 the United States produced 1941 metric tons of carnotite, corresponding to about 11 grms. of radium. The ore is difficult to work owing to the small radium content and the large proportion of silicates present. The ratio Ra : Ba is only one-tenth of the value which holds for pitchblende. A similar material, containing about 1.9% U, is worked at Olary, South Australia. Autunite, $\text{Ca}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$, is usually associated with uranocircite and chalkolith (torbernite), in which the Ca is replaced by Ba and Cu respectively. These minerals occur as incrustations upon certain granitic rocks, especially in Portugal and Russian Turkestan, and thus are often referred to in English literature as Portuguese and Russian carnotites; they contain practically no thorium or lead, and the Portuguese specimens are free from vanadium. The radium content amounts only to 21–70% of the amount required by the Ra : U equilibrium. The high specific gravity (3.0–3.6) facilitates mechanical concentration: so that samples containing only 2–3% U, corresponding to 10 mgrms. Ra per metric ton, may be successfully worked. The ash of culm, a bituminous coal occurring notably in Sweden, contains about 5.5 mgrms. Ra per metric ton and has been mentioned as a possible source of radium, as has also the mineral ampangabeit, which occurs in Madagascar. The extraction of radium from well sediments is dismissed as impracticable. Whenever possible the radium is concentrated by mechanical means, and in all cases is eventually obtained as insoluble sulphate. "Crude sulphate" is a technical term applied to a comparatively pure mixture of barium and radium sulphates with small amounts of silica, etc. Pitchblende was originally worked for uranium by fusion with caustic alkali and an oxidising agent and extraction with sulphuric acid. Curie and Debierne (see this J., 1903, 1363) concentrated the radium in the residue by extracting lead, alumina, silica, etc., through consecutive treatments with boiling sodium hydroxide solution, water, and hydrochloric acid. The residue was boiled with excess of strong sodium carbonate solution and the resulting carbonate converted to "crude sulphate" by solution in hydrochloric acid and precipitation with sulphuric acid. The whole operation occupied about 6 months, the treatment with sodium carbonate alone requiring from 4 to 6 weeks. About 20% of the radium was eventually obtained as pure radium salt and a further 56% in the form of radium-barium mixtures. Marckwald (Ber., 1908, 41, 1529) treated the pitchblende directly with a mixture of sulphuric and nitric acids; this method is also especially applicable to pure autunites, which dissolve readily in acids. Fusion with alkali bisulphate or successive fusion with sodium hydroxide and bisulphate is generally recommended by Sommer and Ulzer (Eng. Pat. 19,820 of 1909; this J., 1910, 1156). According to the process used by the Radium Company of America, carnotite is first concentrated by mechanical means and then treated with sodium hydroxide and water at 200°–300°C., whereby the vanadium is extracted, while the uranium and radium remain in the residue (U.S. Pat. 1,054,102; this J., 1913, 369). In Bleecker's method (U.S.

Pat. 1,015,409; this J., 1912, 237) the vanadium in carnotite is converted into soluble sodium metavanadate by fusion with a mixture of sodium chloride and sodium hydroxide. The insoluble residue is extracted with sulphuric acid, and the undissolved portion fused with sodium hydroxide; "crude sulphate" is then obtained by extracting the fused mass with hydrochloric acid and adding sulphuric acid to the extract. In addition to the cost entailed by using such large amounts of alkali, all these processes suffer from the disadvantages which accompany the formation of much soluble silicate. As a rule, carnotites yield from 2 to 7 kilos. of "crude sulphate" per metric ton; the radium content, however, is only about one-tenth that of the "crude sulphate" from pitchblende. Curie and Debierne purified the "crude sulphate" by repeated successive treatments with concentrated sodium carbonate solution, hydrochloric acid, and sulphuric acid. The carbonate was finally converted to chloride, lead being then removed as sulphide and calcium by evaporating to dryness and extracting the residue with concentrated hydrochloric acid. The residue of crude radium-barium chloride, after several recrystallisations, was finally fractionally crystallised. The tedious treatment of the "crude sulphate" with sodium carbonate solution was avoided by subsequent investigators by reducing the "crude sulphate" to sulphide. Reduction with carbon requires a very high temperature and is only efficient with well purified concentrates consisting essentially of barium sulphate. On the other hand, reduction with calcium carbide, calcium hydride, or a mixture of these substances (this J., 1913, 976; 1915, 78) is applicable to extremely poor "crude sulphates" containing much silica; and in the last two cases the reduction is auto-genous. In all cases the powdered reduction product is stirred into hot dilute hydrochloric acid and the hydrogen sulphide expelled rapidly. The solution is diluted to approximately normal strength and the residue extracted repeatedly with acid of the same strength. The residue consists of lead sulphide and silica, while the solution contains the chlorides of barium, radium, calcium, and iron. The passage of gaseous hydrogen chloride into the solution precipitates barium and radium chlorides (see this J., 1913, 656). The separation of radium and barium salts always involves prolonged fractionation. The older methods included fractional crystallisation of the chlorides (Curie), bromides (Giesel), picrates, bromates, ferrocyanides (Kunheim und Co.), silicofluorides (Landin); fractional precipitation of the chlorides with gaseous hydrogen chloride; repeated formation and decomposition of radium amalgam (Marckwald and Cohn); fractional volatilisation of the bromides (Stoek and Heyemann); partial thermal decomposition of the carbonates (Thiel); and partial conversion of the sulphates into carbonates (Branner). In the newer methods a preliminary concentration of radium is effected through continual fractional adsorption and de-adsorption by means of colloidal hydrated manganese dioxide (see this J., 1913, 1155). The adsorbent is best prepared by adding 1.5-molar manganous chloride solution to 0.2-molar alkali permanganate solution in the proportion required by the equation:



By using suitable amounts of adsorbent most of the radium may be removed from the solution in a concentrated form: radium-barium chloride is then regenerated—and a further concentration simultaneously effected—by dissolving the adsorption product in hot hydrochloric acid and conducting gaseous hydrogen chloride into the solution. The resulting manganous chloride is used in preparing a fresh quantity of adsorbent.

There are further possibilities of an intermediate concentration by means of fractional de-adsorption: fairly successful results are described in which this process was effected by acids, by electrical means, and by the use of salt solutions. In the last case the adsorption product (10 grms.) was boiled for 5 minutes with an $N/1$ solution of the salt (1 litre): of a series of chlorides, that of aluminium gave the maximum concentration of radium in the residue. This concentration increased with increasing concentration of the aluminium chloride solution, but the best absolute yield of radium in the residual undecomposed adsorption product was obtained with a concentration of 15 grms. of crystallised aluminium chloride per litre. The adsorption process may be applied to barium-radium mixtures containing as little as $10^{-6}\%$ Ra, and the method is advanced as a general one for use in similar cases.—J. R.

Radio-elements; Adsorption and precipitation of —, F. Paneth. *Chem.-Zeit.*, 1915, 39, 25. (See also this J., 1914, 22.)

SALTS adsorb best those radio-elements whose analogous compounds (i.e. those compounds containing the same electro-negative radical as the adsorbent salt) are sparingly soluble in the solvent concerned; this result supports the view that anion and cation retain their characteristic separable valencies even in the solid substance, and that the insolubility of precipitates also depends upon such retention. In view of the kinetic atomic exchange which necessarily occurs at the surface of the adsorbent, this assumption provides an adequate explanation of the adsorption rule. The fact that radio-elements may be precipitated at concentrations much below that corresponding to the solubility product is referable to the same cause.—J. R.

Thorium and radium emanations; The condensation of —, A. Fleck. *Phil. Mag.*, 1915, 29, 337—362.

WHEN air mixed with thorium and radium emanations at atmospheric pressure is cooled, the thorium emanation appears to be condensed about 5°C . higher than the radium emanation, the apparent difference being due probably to the radium emanation in the gaseous phase over the condensed phase being swept away by the air current, whilst the thorium emanation is rapidly converted into solid active deposit and is thus retained more completely. In a highly exhausted tube, the emanation is more easily condensed as its concentration diminishes, and in certain circumstances the condensation curve of the radium emanation exhibits two maxima, one about -75°C . and the other about -161°C . It is suggested that this property may be dependent on the presence of water vapour. The existence of at least one maximum (probably the one at -161°C .) was further confirmed by means of a glass tube containing a large quantity of radium emanation, floating vertically in liquid air. A ring of bright luminosity was observed just above the surface of the liquid air, which was not due to a condition of the glass, nor to a concentration of the active deposit away from the emanation. Experiments with other forms of tubes have shown that internal changes are liable to take place inside the tube, which completely alter the condensation curve obtained. In a highly exhausted tube, at the temperature of liquid air, 0.0915% of radium emanation remained uncondensed. With thorium emanation, in a highly exhausted tube, the greater part was condensed between -165° and -170°C . When the two emanations were mixed in such a tube, the radium one appeared to be more easily condensed, but this was probably due to the rapid disintegration of the thorium emanation. In

one experiment, indirect evidence was obtained, which appeared to point to thorium and radium emanations being non-separable by condensation.—B. N.

Cathode rays; Salts coloured by — and the molecular force field theory. E. C. C. Baly. *Chem. News*, 1915, 111, 85—86.

THE author sees in the salts coloured by cathode rays, described by Goldstein (this J., 1915, 76), a further illustration of his molecular force field theory, and compares them with the metastable nitrophenol ethers in regard to their electromagnetic condition. If in a molecule the component atomic fields happen to balance, the molecular field will be entirely closed. The field may be opened, and the molecule rendered reactive by solution, and also by the presence of molecules possessing residual affinity independently of whether a solution is formed or not. In this latter case the system can absorb light selectively, thus shifting the equilibrium towards the reactive side, and compounds with their force fields opened out to a relatively high stage, hitherto only known among organic substances—nitrophenol ethers, nitroanthrone, etc.—would be expected also in the case of inorganic salts. As representatives of such metastable inorganic compounds, Goldstein's highly coloured salts appear to conform to the deductions of the force field theory in every way, except as regards abnormal reactivity, which yet remains to be proved.—G. F. M.

Colloids; Electric synthesis of —, J. Mukhopadhyaya. *J. Amer. Chem. Soc.*, 1915, 37, 292—297.

SOLS of sulphur, selenium, and arsenic were readily formed by passing a current of 15 amps. through a thin platinum wire coated with the substance and surrounded by "conductivity" water. Better results were obtained by using a current of 2 amps. at 220 volts to produce an arc between two carbon electrodes immersed in water, the latter being cooled in a freezing mixture. The lower, flat-headed electrode was coated with the molten substance, through which, after solidification, a small hole was pierced; the arc passed between the part of the lower carbon thereby exposed and the pointed end of the upper carbon. Phosphorus, sulphur, and selenium yielded fairly stable sols in this way. With selenium a current of 0.6 amp. was used. Cadmium gave an unstable sol which soon coagulated, forming a mixed precipitate of metal and hydroxide. Copper behaved similarly, the precipitate consisting of a mixture of metal and oxide. A platinum cup was used in the case of mercury; the sol, which was grey, stable, and very pure, carried a negative charge. Sol formation under these conditions is attributed to volatilisation followed by condensation. Cadmium and copper sols are unstable owing to precipitation caused by the oppositely charged colloidal hydroxide (positive) and colloidal metal (negative). In the case of the stable colloidal solutions of gold, platinum, silver, and mercury, the sol consists entirely of metallic particles.—J. R.

Hydrogen peroxide solutions; Acidity of —, J. S. White. *Pharm. J.*, 1915, 94, 316.

THE acidity of hydrogen peroxide solutions when determined by the B.P. (1914) method (direct titration with $N/10$ alkali, using methyl orange as indicator) is considerably less than when determined by the U.S.P. method (decomposition of the hydrogen peroxide by evaporation with excess of standard alkali and subsequent titration with standard acid, using phenolphthalein as indicator). The author considers this difference to be due to the presence of undecomposed

hydrogen peroxide in the B.P. process, which prevents the complete neutralisation of the acid present.—T. C.

Sulphuryl chloride; The dissociation and formation of—M. Trautz. Chem. Ges. Heidelberg, Dec. 18, 1914. Chem.-Zeit., 1915, 39, 100.

BETWEEN 18° and 100° C. the reversible reactions, $\text{SO}_2 + \text{Cl}_2 \rightleftharpoons \text{SO}_2\text{Cl}_2$, without exposure to light, could not be maintained as pure gas-reactions; only on the addition of animal charcoal could fairly reproducible results be obtained. Both reactions then behaved as adsorption reactions, without any disturbing effect due to diffusion. The order of the reaction was roughly normal in both cases, but more exactly so in the case of the dissociation than in that of the formation. The formation was almost independent of temperature; the dissociation had a temperature coefficient of about 1.5. These and other observations could all be explained by the restricted sphere of the reaction (confined to the adsorption layer) as compared with a normal gas reaction. The formation of SO_2Cl_2 under the influence of the light of the quartz and "uviolet" lamp was studied at 18° and 99° C., at various concentrations. At the higher temperature it took place fairly normally as a reaction of the second order. The accumulation of by-products, both in this reaction and, after a time, in the reversible reaction in the dark, has a disturbing effect upon the constants. The dissociation under the action of light gave no constants at all on this account. The velocity of formation of SO_2Cl_2 in light was almost independent of temperature and in that respect normal. The velocities of the reaction in presence of charcoal and in presence of light were of a similar order of magnitude.—J. F. B.

Sulphur; Methods of analysis of—M. G. Levi. Annali Chim. Appl., 1915, 1, 9—31.

THE author examined the methods available for the determination of sulphur in crude sulphur, especially as applied to low-grade Sicilian sulphur contaminated with bituminous matter. The method of Carius does not yield accurate results (compare Ancelli, this J., 1911, 573), and combustion in a current of oxygen, though serving well for the purer kinds of sulphur, is tedious and less accurate when applied to samples containing notable quantities of bitumen. Satisfactory results are obtained by the method of Fresenius and Beck (Z. anal. Chem., 1903, 42, 21), in which 10 grms. is heated at a little above 200° C. to volatilise the sulphur, the residue weighed, and then incinerated to determine the bitumen. Accurate results can be obtained by oxidation with nitric acid and bromine by adopting the following method. About 0.2 gm. of the sulphur is weighed directly into a 100 c.c. conical flask, which is then fitted, by means of a ground glass joint, with a reflux tube. The flask is immersed in cold water and whilst held in an inclined position 10 c.c. of fuming nitric acid (sp. gr. 1.52) and 5 drops of bromine are introduced successively through the reflux tube. The flask is shaken occasionally until most of the sulphur and bromine is dissolved, whereupon a further 5 c.c. of nitric acid is added, and after heating for $\frac{1}{2}$ hour on the water-bath, the flask is again immersed in cold water, the solution diluted with 50 c.c. of water added in small portions through the reflux tube, and the sulphur determined as barium sulphate in the usual way. With low-grade sulphur, the determination should always be made with the sulphur separated from the original sample by extraction with carbon bisulphide.—A. S.

Oxygen; A sharp reaction of free—K. Binder and R. Weinland. Z. komprim. u. flüss. Gase, 1913, 102—105. Chem.-Zeit., 1914, 38, Rep., 485.

ELEMENTARY oxygen imparts a red colour to an alkaline solution of catechol and ferrous sulphate; the reaction may be applied to the quantitative determination of oxygen in gaseous mixtures.—J. R.

Liquid air; The use of—in industry. Engineering, 1915, 99, 98—100, 155—157.

THE use of liquid air in industry has now reached very considerable proportions, and it is stated that there are machines of the Linde and Claude types installed which are capable of producing well over 30,000 gallons of liquid air per hour. The greater part of this liquid air is used for the production of oxygen and nitrogen; neon is obtained as a by-product and is used for filling tubes for electric lighting (see Claude, this J., 1911, 13, 736). Descriptions are given of the two chief types of apparatus, namely those of Linde and Claude. Liquid air is also used for separating pure hydrogen from "blue" water gas (see this J., 1911, 744). The only rival to the liquid air method of producing oxygen is the process of decomposing water by electricity, and this cannot compete in cost unless a market can be found for the hydrogen as well as the oxygen. Oxygen is now very largely used for welding and cutting metals by the oxyacetylene blowpipe, for enriching air for blast furnaces, and for increasing the yield of nitric acid in the Birkeland-Eyde electric and the Haeusser explosion processes. Liquid oxygen mixed with organic substances has been tried as an explosive. Nitrogen is largely used for the manufacture of cyanamide, for the Serpck process of preparing aluminium nitride, and for the Haber process of synthesising ammonia.—W. H. C.

PATENTS.

Sulphurous acid and oxides from [alkaline-earth] sulphates; Manufacture of—A. Bamback. Fr. Pat. 470,652, April 8, 1914.

THE sulphate is heated to redness by contact with a burning mixture of gas and air, and the residue is then further heated, either by a flame containing an excess of air, or by the successive action of a reducing flame and oxygen (preferably as air). The process may be applied to sulphides, the heated material being decomposed with an oxidising flame or air.—F. SODN.

Acetic acid; Manufacture of—Farbw. vorm. Meister, Lucius, und Brüning. Fr. Pat. 471,255, April 22, 1914. Under Int. Conv., April 26 and Dec. 15, 1913.

SEE Eng. Pat. 10,377 of 1914; this J., 1914, 961. The simultaneous action of different catalysts, with or without pressure, is also claimed.—F. SODN.

Sodium carbonate crystals; Apparatus for the manufacture of—M. Spazier, Cincinnati, Ohio. U.S. Pat. 1,127,691, Feb. 9, 1915. Date of appl., April 20, 1914.

TWO crystallising tanks, in which are mounted cross-bars with depending hangers to act as crystallising centres, are separated by a space permitting access to a drain board sloped so as to discharge drainage into both tanks. A surplus solution tank, above the drainage board, may also discharge into either tank.—F. SODN.

Sulphocyanides [thiocyanates]; Treatment of—[to produce ammonia]. P. E. Williams, Waukegan, Ill. Eng. Pat. 2841, Feb. 3, 1914.

A THIOCYANATE is heated with an alkali or alkaline earth and water, and the evolved ammonia rendered free from accompanying carbon oxysulphide

by passing it at once into contact with an alkaline-earth hydroxide. For example, a solution of calcium thiocyanate is evaporated nearly to dryness, mixed with slaked lime, the mixture covered with a layer of slaked lime, and the whole gradually heated to 500°–600° C. in a closed chamber, supplied with water or steam, with or without air.—F. SODN.

Ammoniacal liquor; Process for the complete extraction of industrial chemical products contained in crude—L. C. Bonneau and V. E. Hasenfratz. First Addition, dated April 3, 1914, to Fr. Pat. 468,535, April 26, 1913 (this J., 1914, 992).

SULPHUR is extracted in a digester, fed with the boiling solvent and communicating by a siphon with a distilling apparatus in which the dissolved sulphur is recovered, the condensed solvent being returned continuously to the digester. When the material is exhausted, it is transferred with water to a vessel fitted with a stirrer, in which adhering solvent is recovered by heat, and distillation with lime commenced, and from this vessel the mixture is pumped into a column for the complete removal of ammonia. The solution is then led through settling vats, treated with potassium chloride, and the precipitated calcium-potassium ferro-cyanide boiled with sodium carbonate and filtered. The filtrate is treated with ferrous sulphate and the resulting precipitate oxidised to Prussian blue, which is washed and dried.—F. SODN.

Nitrogen compounds from carbides; Process of manufacturing—T. Fujiyama, Tokyo, Japan. U.S. Pat. 1,126,000, Jan. 26, 1915. Date of appl., Feb. 25, 1914.

PULVERISED carbides are burnt in a closed chamber and nitrogen is introduced to combine with the burning substance, more material being added to keep the product covered with a layer of carbide. Decomposition is prevented by cooling the chamber.—F. SODN.

Rare earth metals; Manufacture of compounds of the—Gehr. Siemens und Co. Fr. Pat. 470,633, March 21, 1914. Under Int. Conv., April 1, May 17, and July 16, 1913.

SEE Eng. Pat. 8015 of 1914; this J., 1914, 830. The reaction may be interrupted when an intermediate double fluoride of rare earth metal and calcium has been precipitated, and an organic acid, such as oxalic acid (preferably 5% of the weight of rare earths), may be added to the reaction mixture.—F. SODN.

Nitrogen compounds from pulverised carbides; Process of manufacturing—T. Fujiyama, Tokyo, Japan. Eng. Pat. 9259, April 14, 1914.

SEE U.S. Pat. 1,126,000 of 1915; preceding.

Electrolysing alkali-chloride solution; Process for—W. Gaus, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen on Rhine, Germany. U.S. Pat. 1,126,027, Jan. 26, 1915. Date of appl., Nov. 11, 1912.

SEE Fr. Pat. 446,640 of 1912; this J., 1913, 112.

Sulphur and sulphates from polythionate solutions; Production of—W. Feld, Linz, Germany. K. E. Markel, London, Administrator. U.S. Pat. 1,127,219, Feb. 2, 1915. Date of appl., July 11, 1912.

SEE Eng. Pat. 10,147 of 1912; this J., 1913, 602.

Pumps for corrosive liquids. Eng. Pat. 4482. See I.

Heat-producing compound. U.S. Pat. 1,126,055. See IIb.

Preparation of the products of oxidation of organic compounds. Ger. Pat. 277,733. See III.

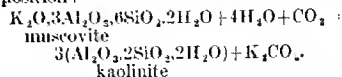
VIII.—GLASS; CERAMICS.

Glass for medicine bottles; Tests for determining suitability of—L. Kroeber. Münchener Pharm. Ges., July 17, 1914. Chem.-Zeit., 1914, 38, 1196.

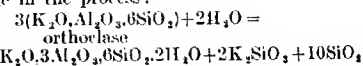
GLASS bottles for holding medicines should, after sterilising in steam at 100° C. for 30 minutes, answer the following tests, the reagents being put into the bottles and examined after 24 hours. (1.) Distilled water should give no iridescent film of silicate; (2.) a 1 to 2% morphine solution should be colourless or show at most a pale yellow colour; (3.) no separation of crystals should take place in a 0.5% solution of strychnine nitrate; (4.) a 1% mercuric chloride solution should show no separation of coloured oxide; (5.) from 2 to 3 drops of phenolphthalein solution in 100 c.c. water should develop at the most a pale rose colour, disappearing on the addition of 1 to 3 drops of N/10 acid. (6.) a 0.1% solution of narcotine hydrochloride should show at the most only traces of dust-like particles but no flocculent matter after one hour. Before using bottles for medicines, they should be treated for 1 hour with 1% hydrochloric acid and then thoroughly washed with water.—T. C.

China-clay; Microscopic characters of—G. Hückling. J. Soc. Dyers and Col., 1915, 31, 70–74.

THE same mineral constituents appear to be present, in varying proportions according to the fineness of the sample, in all the grades of material into which the original rock is separated by "washing," except that the chief constituents of the clays, kaolinite and secondary muscovite, rarely occur in grains more than 0.03 mm. in diameter, and are therefore absent from the coarser sediments. The minerals present are quartz, tourmaline, primary muscovite (original constituent of the granite), secondary muscovite (produced in the decomposition of the felspar), and kaolinite. The first three occur in large fragments and are readily identified under the microscope, but kaolinite and secondary muscovite present difficulty, on account of their minuteness and irregularity of form. Both minerals occur in the form of curved prisms known as "rouleaux," which appear to be built up of a pile of fine plates, suggesting piles of coins. By determining the refractive indices (by immersion in mixtures of oil of clove and oil of cedar), it was found possible to differentiate between the rouleaux of muscovite and of kaolinite in certain cases, but some of the crystals gave intermediate values. Considerable evidence has been found that the percentages of muscovite obtained by chemical analysis are too high. It is probable that the muscovite is gradually transformed into kaolinite, and that the clay very largely consists of crystals intermediate in composition:—



The conversion of felspar into kaolinite is due to the gradual extraction of the alkali and loosely combined silica, muscovite being an intermediate stage in the process:—



China clay consists principally of the intermediate decomposition products from muscovite to kaolinite. The most obvious feature in the microscopic structure is the great variation in the size of the particles (0.03–0.0005 mm. diameter). The whole of the particles appear to be crystalline. The usual statement that china-clay consists mainly

of minute flakes is correct, but these flakes are plates split off from the rouleaux. It does not appear that the subdivision of the clay particles according to size has any material effect on the proportion of the various minerals present. Rouleaux are extremely rare in common clays, which contain a much greater variety of minerals than china-clay.—F. W. A.

Crystallisation in silicate liquids. Bowen. See VII.

PATENTS.

Glass-making furnace. L. A. Thornburg, Arnold, Pa., Assignor to American Window Glass Machine Co., Pittsburgh, Pa. U.S. Pat. 1,127,115, Feb. 2, 1915. Date of appl. Nov. 20, 1909; renewed June 14, 1913.

THE furnace is provided with a forehearth, which constitutes an extension of the drawing chamber, communication between the two being controlled by a vertical damper, which can be raised or lowered simultaneously with the topstone of the drawing chamber. Means are provided for cooling the topstone. The horizontal extension of the drawing chamber has on its base a central chilling boss, surrounded by a ring, and also a floating member which can be brought into position over the boss. The drawing chamber extension is shallower than the forehearth proper, but increases in depth towards its outer end.—W. C. H.

Glass-furnace. S. B. Henshaw, Assignor to The Charleston Window Glass Co., Charleston, W. Va. U.S. Pat. 1,127,245, Feb. 2, 1915. Date of appl. Oct. 6, 1913.

THE casing of the working chamber projects over the mass of molten glass and has an opening through which the glass can be drawn, and across which flame jets can be projected. A structure, which floats in the molten glass and can be rotated, is provided with openings which are successively brought into line with the drawing opening of the furnace. The structure is rotated by a wrench which engages with a socket, and a detachable sleeve of refractory material mounted upon and rotated with the structure protects that portion of the wrench which is in the path of the flame jets projected across the drawing opening.

—W. C. H.

Insulators; Manufacture of high-potential porcelain and glass.—*Insulator.* F. M. Locke, Victor, N. Y. U.S. Pats. (A) 1,127,042 and (B) 1,127,044, Feb. 2, 1915. Date of appl. Mar. 9, 1909.

(A). A VITRIFIABLE base and a boron compound or derivative are moulded and fired to form a homogeneous body which serves as a high potential insulator. (B). The insulator is formed of silica or a fusible silica base and a boron compound which are fused together into a homogeneous body.

—W. C. H.

Bodies or small particles of substances [glass, etc.]; Method of producing.—E. Morf, Zürich, Switzerland, Assignor to Metals Coating Co. of America, Boston. U.S. Pat. 1,128,175, Feb. 9, 1915. Date of appl. Dec. 2, 1912.

SEE Eng. Pat. 28,001 of 1912; this J., 1913, 792.

IX.—BUILDING MATERIALS.

Wood; Rapid drying and preservation of—by Nodon's electrical process. C. Dantin, Le Génie (Civil), 1914, 65, 98—101. Bull. Bureau Agric. Intell., 1914, 5, 1650—1652.

NODON'S process for drying and preserving timber consists in stacking it to a height of 3—5 ft. and

inserting an electrode mat between each layer. The mats are made of pliable galvanised iron wire netting covered with strong jute cloths, and are saturated with water and so connected to the conductors conveying the alternating current, that the latter passes through the thickness of each layer of timber. The treatment lasts one or two days, and on its completion the wood is dried by exposure to the air for a few weeks. The cell sap is completely oxidised by the treatment so that only resinous substances remain: the cellulose is so modified that it does not readily putrefy; inherent fungi, germs, etc., are destroyed, and the heated product is unaffected by injurious insects. One cubic metre (35 cb. ft.) of wood requires 150 ampère-hours, with an E.M.F. of 40 volts for wood in full sap and 80—100 volts for unbarked wood that has been kept for some time. The cost of treatment is given as about 3d. per cub. ft. when the process is carried out in the forest, and 1d. in factories. Wood of all kinds can be treated. The Municipality of Bordeaux has stated officially that "Nodonised" wood used for road paving is more durable than untreated wood.—E. H. T.

PATENTS.

Concrete and the like: Mixing machines for.—F. L. J. Albert and P. M. J. Cosse, Nantes, France. Eng. Pat. 2582, Jan. 31, 1914.

PADDLES rotating in a cylindrical mixing chamber are provided with large rectangular, shovel-like blades, with smooth surfaces, shaped so as to pick up the concrete from the edge of the cylinder, compress it, allow it to fall freely, and intimately mix it: the blades are inclined at a suitable angle to avoid excessive friction and jamming. Controlling arrangements are provided by which a skip is caused to raise material and eject it into the mixing chamber, the paddles are made to rotate and mix the materials and are then stopped, and the mixing chamber is rotated to eject the mixture and return to its original position. The paddles may be driven through a suitable planetary speed reducer, and the concrete chamber may be locked and a definite amount of water admitted. The paddles are arranged on a common shaft, in sets of two or more at the centre and singly at each end.—W. C. H.

Clinker: Apparatus for cooling—in the manufacture of cement, and for like cooling purposes. C. M. Park, Blackburn. Eng. Pat. 2661, Feb. 2, 1914.

THE material is conveyed by a shoot into a rotary tank containing water and provided with plates and screens to lift the material while rotating, and with a casting curved outwards or a drip flange with trough at its inlet to carry away excess water. The shoot through which the material is delivered into the tank is connected with a conduit leading to a chimney for carrying off escaping steam. From the rotary tank the material passes to a series of revolving annular trays provided with open air spaces between them. The exits in the peripheries of the trays are so arranged that the material has to traverse a sufficient distance to obtain the necessary cooling.—W. C. H.

Wet grinding [of cement materials]; Process of.—H. E. Rinsager, Frederiksberg, Denmark. Assignor to F. L. Smidth and Co., New York. U.S. Pat. 1,126,085, Jan. 26, 1915. Date of appl. April 18, 1912.

THE cement materials together with water are placed in a rotary drum, and the consistence of the slurry is regulated by varying the radial distance of the outlets for the water and the slurry in the discharge head of the drum.—W. H. C.

Manufacture of moulded objects from blast-furnace slag. Ger. Pat. 275,497. See X.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Steel; Sound—*for rails and structural purposes.* R. A. Hadfield. J. Franklin Inst., 1915, 179, 119—140.

STEEL ingots made by the author's feeding method (this J., 1912, 987) are free from blowholes, pipes, and segregation, the presence of the cavity in the head giving visible evidence of the soundness of the ingot. Close upon 40,000 tons of ingots have been produced by the method, and every ingot has been absolutely sound. By cutting up over 100 ingots made by this method the possibility of manufacturing perfectly safe steel shell with only 10 to 12% discard has been demonstrated. —T. ST.

Carbon (in iron and steel); Experiments with H. de Nolly's apparatus for the determination of —. R. Lepsoe. Chem.-Zeit., 1914, 38, 1137—1138.

The method of de Nolly for the rapid determination of carbon in iron and steel (this J., 1911, 688, 1216) gives very accurate results, and is suitable for the control of Martin and electric steel furnaces. It is applicable to all kinds of steel, 1—2 grms. of sample being mixed with 0.1—0.2 grm. of lead peroxide or bismuth trioxide. Pig-irons and ferro-alloys must be passed through 80-mesh and 120-mesh sieves respectively, and burnt on a layer of 1—2 grms. of pure iron containing 0.05—0.08% C. —T. ST.

Platinum in litharge. F. Michel. Chem.-Zeit., 1915, 39, 6.

LITHARGE (02.5 grms.) was reduced by flour (15 grms.) with a flux composed of 3 parts each of pure sodium and potassium carbonates, 1.5 of pure borax and 1.5 of pure sodium chloride. The buttons from 8 charges of the same sample, i.e. from 1 kilo., were scorified together, the resulting button cupelled, and the remaining platinum, gold, and silver estimated. The amounts (a) of Pt, Au, and Ag found in three different samples of litharge, together with the amounts (b) found in the litharge formed during the scorification of these samples, are shown in the table.

| Litharge from | Pt, mgrms. per kilo. | | Au, mgrms. per kilo. | | Ag, mgrms. per kilo. | |
|----------------|----------------------|-------|----------------------|-------|----------------------|-------|
| | (a) | (b) | (a) | (b) | (a) | (b) |
| Leiburg | 0.417 | 0.123 | 0.916 | 0.290 | 25.33 | 5.988 |
| Frankfurt a/M. | 0.350 | 0.080 | 1.950 | 0.362 | 11.22 | 2.666 |
| Mulheim | 0.111 | 0.034 | 0.666 | 0.142 | 10.00 | 2.446 |

—T. ST.

[Silver-copper ore;] Chloridising blast roasting and leaching [low-grade —]. G. A. Keep. Eng. and Min. J., 1915, 99, 265—269 and 315—322.

DETAILS are given of the treatment of low-grade refractory ore (argentiferous copper-lead-zinc sulphides, etc.), some of which was formerly used as mine filling at Park City, Utah. A mixture of the crushed ore with coal dust (2—3%), common salt (7—8%) and sufficient water (5—10%) to render the mass more porous than when dry, is charged to a depth of 6—7 ft. on to a bed of red-hot fuel through which an upward blast of air is maintained. Combustion and chloridising proceed gradually and simultaneously from the bottom to the top of the column; the action being localised

and losses by dusting and volatilisation prevented by the combined blanketing effects of the cake formed immediately above the roasting zone (by the cementing action of the salt) and the moisture condensed in the upper portion of the charge. The roasting is usually completed in 3—5 hours, the gaseous products being passed through water or mill solution and the resulting "tower acid" (containing sulphurous, sulphuric, and hydrochloric acids and chlorine) employed for leaching the roasted material. The yield of acid, which depends on the proportions of sulphide in the ore and salt in the charge and also on the nature of the gangue, is increased when necessary by the addition of pyrites to the charge, in which case the proportion of coal dust is reduced. The addition of pyrites to ore containing lime is essential to neutralise (sulphate) the lime before leaching; but the process is generally not suitable for the treatment of calcareous ores. The red-hot, chloridised product, which should be readily friable, is sluiced from the roaster to the leaching tanks by means of acid mill solution maintained at 30° C. or above, the solution from the tanks being passed over copper to precipitate the silver, and over iron to recover the copper and part of the lead, and then re-acidified for leaching further charges; no trouble is experienced by fouling, the iron content of the mill solution remaining practically constant at 1—2 lb. per ton. In the case of auriferous ores, complete chloridising of the gold is ensured by the addition of bleaching powder (0.25—0.5%) to the roasted product while the latter is being sluiced into the tanks. With most ores the extractions of silver, copper, and gold obtainable by this process are 85—90, 90—98, and 90% respectively. The cost of roasting and chloridising in the concrete furnaces originally employed was 83.3 cents (3s. 10½d.) per ton of ore, this amount including 32 cents (1s. 4½d.) for salt; by the adoption of the Holt-Dern roaster the cost per ton of ore has been reduced to 17.9 cents (8.95d.) exclusive of salt. The cost of leaching varies from 17 to 41 cents (8½d. to 1s. 8½d.) per ton according as the acid required is condensed from the roaster fumes or purchased. A small experimental plant for testing ores as to their suitability for treatment is also described, together with the results of an investigation of the process made at the Utah School of Mines.—W. E. F. P.

Colloidal gold and silver; Experiments with —. E. S. Bastin. J. Wash. Acad. Sci., 1915, 5, 64—71.

THE mineral chalcocite (Cu₂S) and such metals as zinc, copper, tin, and cadmium precipitated gold from warm dilute (N/40) aqueous solutions of auric chloride as a dark-brown or black coating. In the presence of an emulsoid sol of gelatin stable colloidal solutions of gold resulted, which were deep blue by transmitted and bright brick red by reflected light in the first three cases, while tin yielded "purple of Cassius" solution and cadmium gave a solution which was dark brick red by reflected and purple by transmitted light. In some cases the precipitation of the gold was similarly delayed in the presence of a colloidal solution of silica. On the other hand, minerals and metals such as pyrites, galena, and bismuth, which precipitated gold in the lustrous yellow or orange condition, failed to give colloidal solutions in the presence of the gelatin or silica sol. It is hence suggested that the dark-brown or black gold represents a state of fine division approaching that of a coagulated colloid. Analogous results were obtained in precipitating silver from silver sulphate solutions. The author concludes that transport of these metals in the colloidal condition may occur in the process of primary ore deposition. —J. R.

Copper and its important alloys (bronzes and brasses) and aluminium; Welding of— with the oxyacetylene flame. I. Carnevali. *La Metal.* Ital., 1914, 139. *Annali Chim. Appl.*, 1915, 1, 62.

THE microstructure and mechanical properties of copper and its alloys are deteriorated markedly by oxyacetylene welding. Copper becomes coarsely crystalline, whilst the alloys show a minute heterogeneous structure with discontinuities produced by oxides and blow-holes. The tensile strength of copper is reduced by 50% and the elongation by one-tenth. The strength of the welded joint is not notably improved by mechanical treatment (e.g. hammering), but only by prolonged annealing. Aluminium is affected much less than copper by welding. Its mechanical properties are not altered to any considerable extent, except that the metal is rendered somewhat more brittle; the effects of the welding may be removed by both mechanical and thermal treatment of the joint. —A. S.

Zinc and manganese; Alloys of —. N. Parravano. *Gaz. Chim. Ital.*, 1915, 45, 1, 1—6.

ALLOYS containing up to about 30% Mn were examined. They are hard and brittle, and when containing from 5 to 20% Mn are usually traversed by fissures. Two compounds, $MnZn_2$ and $MnZn_3$, are formed, and there is a general resemblance to the corresponding alloys of zinc and iron (see this J., 1907, 153). Photomicrographs of alloys containing respectively 5.3, 15.6, 21.4, and 28.3% Mn are given.—A. S.

Ionisation of metals by cathode rays. N. Campbell. *Phil. Mag.*, 1915, 29, 369—383.

EXPERIMENTS on the ionisation of platinum by cathode rays, described previously (*Phil. Mag.*, 1914, 286) have been extended to other metals, and to higher speeds of the incident rays. The changes in the ionisation, found to take place on heating platinum, can also be produced in platinum, copper, and nickel by making the metal one electrode of an electric discharge in air, oxygen, hydrogen, or petrol vapour at about 2 mm. pressure; the changes were greatest in copper. In aluminium hardly any change could be produced. The changes appear to be connected with "sputtering" of the metal, which gives rise to a roughened surface. The highest ionisation is shown by the metal after polishing, and it is suggested that in this state the surface of the metal is covered by a layer of gas. The metal may also be in various other states, one of which—characterised by exhibiting the next highest ionisation to the polished metal—can be reproduced from any of the others by bombarding the metal with cathode rays; the condition corresponding to the polished metal cannot be reproduced by such treatment. —B. N.

Electric synthesis of colloids. Mukhopadhyaya. See VII.

Action of hydrogen peroxide on metals and its use for disinfecting instruments. Eichholz. See XIXb.

PATENTS.

Steel; Manufacture of chrome nickel— for armour plates, projectiles, and the like. Comp. des Forges et Aciéries de la Marine et d'Homécourt, Paris. Eng. Pat. 10,687, July 13, 1914. Under Int. Conv., June 23, 1914.

FROM 0.15 to 0.30% of titanium is added to the chrome-nickel steel known as "33-metal" (C 0.65—0.80, Cr 3.40—4.00, Ni about 2.5%; see Eng. Pat. 25,742 of 1907, this J., 1908, 944) to raise the critical cooling point and improve the machining and other qualities of the alloy.—W. E. F. P.

Metallic articles; Method of manufacturing composite —. J. Kirby, Pittsburgh, Pa. U.S. Pat. 1,126,484, Jan. 26, 1915. Date of appl., Nov. 28, 1913.

IRON or steel is coated by heating to about 1500° F. (815° C.) and immersing in a molten bath of Cu, Al, and V, maintained at about 2100° F. (1149° C.). —T. St.

Iron, boron, carbon, and copper alloy. E. D. Gibson, New York, Assignor to New Metals and Process Co., Long Island City, N.Y. U.S. Pat. 1,126,629, Jan. 26, 1915. Date of appl., Dec. 31, 1912.

AN alloy of Fe, B, and Cu, containing approximately 80% Fe and boron in excess of the quantity required to combine with the copper. Some of the carbon primarily present in the iron is retained in the alloy.—T. St.

Tungsten (wire); Manufacture of —. C. Gladitz, London. Eng. Pat. 24,028, Oct. 23, 1913.

DRAWN tungsten or other wire is wound for the subsequent heat treatment on a bobbin containing deep V-grooves, so that when the wire is slackened somewhat it cannot get entwined. A metallic pin, the barrel of which is cut away at one side to form a flat surface, passes through the flanges of the bobbin parallel to the axis. The pin is provided at one end with a butterfly wing head, and a locking device prevents unintentional rotation. By rotating the pin the wire wound on the spool may be tightened or slackened, the size and shape of the pin being preferably chosen to give an increased length of coil of about 6% when the convex portion is turned outwards. To prevent the edges of the pin from chafing the wire, a shield of spring steel which fits into suitable slots is provided. The pin is turned with its convex surface outwards when the wire is received on the spool, but before introducing the latter into the furnace the flat side of the pin is turned outwards. The wire thus remains slack during the heat treatment even if its coefficient of expansion is less than that of the metal of the spool, and sufficient freedom is ensured for the recrystallisation process. After treatment the pin may again be turned so that the wire is tightened for re-spooling or re-drawing.—T. St.

Wires of refractory metals; Process for cleaning and reducing the diameter of —. S. Burgstaller and P. Schwarzkopf. Ger. Pat. 278,415, July 10, 1913.

WIRES of refractory metals, such as tungsten or molybdenum or their alloys, are cleaned and made thinner by leading them through a series of electrolytic baths in which they act as intermediate electrodes. The baths are arranged in pairs, those of each pair containing respectively an alkaline liquid, preferably a dilute solution of potassium hydroxide, in which the wire acts as anode, and an acid liquid, preferably very dilute sulphuric acid, in which it acts as cathode.—A. S.

Aluminium and alloys containing it; Flux for use in the welding or soldering of —. E. Thaulow, Frederiksberg, Denmark. Eng. Pat. 5356, March 2, 1914. Under Int. Conv., Dec. 16, 1913.

A FLUX for use in welding or soldering aluminium and its alloys, and having a lower melting point than aluminium, is composed of a borate and one or more bisulphates of alkali metals. An example is borax 96 and sodium bisulphate 4 parts.—T. St.

Smelting-furnace. T. M. Kekich, Assignor to C. Haussens, Aire Libre, Mexico. U.S. Pat. 1,126,028, Jan. 26, 1915. Date of appl., July 3, 1912; renewed June 25, 1914.

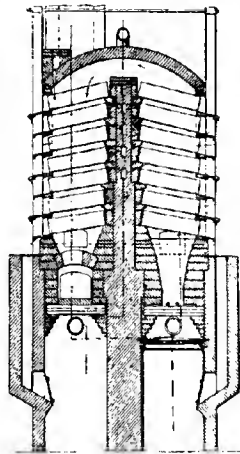
IN a blast-furnace of the type wherein the constituents of the charge are arranged in layers, two

sets of tuyères controlled independently are arranged on opposite sides of the furnace and at different levels.—T. St.

Smelting [retort] furnace. E. V. Lanyon and F. A. Curnow, Pittsburgh, Kans. U.S. Pat. 1,127,264, Feb. 2, 1915. Date of appl., April 11, 1914.

THE furnace (see fig.) comprises a pair of retort-heating chambers, arranged back to back, and communicating at the top. Heating gases from a fire-box at the lower part of the first (right-hand) chamber traverse the two chambers in succession and pass out at the bottom of the second. A system of pipes along the exterior of the furnace delivers air under the fire-box and to the inner sides and top of the second chamber, which is connected with the stack by two flues adapted to be used alternately.

—W. E. F. P.



Carnotite ores; Method of treating complex — C. W. Danforth and W. T. Marterstick, Youngstown, Ohio, and W. P. Samuels, New Castle, Pa. U.S. Pat. 1,126,182, Jan. 26, 1915. Date of appl., May 1, 1914.

THE finely divided ore is roasted, treated while hot with a strong solution of sulphuric acid, and the mixture filtered; vanadium and uranium are recovered from the filtrate and radium from the insoluble residue.—W. E. F. P.

Platinum metals; Process of recovering native — R. E. Lyons, Bloomington, Ind. U.S. Pat. 1,126,646, Jan. 26, 1915. Date of appl., Nov. 19, 1914.

THE material is treated with zinc amalgam and acid to produce an "alloy" of platinum, etc., and zinc which is subsequently recovered by amalgamation.—W. E. F. P.

Ores [blende]; Process of treating — J. W. Emerson, Salida, Colo. U.S. Pat. 1,126,965, Feb. 2, 1915. Date of appl., Feb. 19, 1914.

CONCENTRATES containing blende are passed in a thin layer on an endless belt through an acid bath of such a strength that just enough gas is developed on the blende particles to produce clumped blende aggregates, which rise a little above the other material. The aggregates are then removed by an arrangement similar to an endless chain of dredger buckets.—T. St.

Mill-scale [containing tungsten]; Method of treating — F. M. Becket, Assignor to Electro Metallurgical Co., Niagara Falls, N.Y. U.S. Pat. (A) 1,127,162 and (B) 1,127,163, Feb. 2, 1915. Date of appl., April 8, 1914.

(A) TUNGSTEN alloys are prepared from high-speed mill-scale containing tungsten by removing a portion of the iron, then treating with an acid reagent to remove phosphorus, and finally reducing by means of a non-carbon reducing agent. (B) Mill-scale containing tungsten is subjected to a reducing operation at a temperature below the melting point of the reduced product, and the

tungsten concentrated by removing a portion of the iron. Phosphorus is then removed by treating with an acid reagent, and the purified concentrate is fused in an electric furnace in presence of silicon.—T. St.

Flue dust; Sintering process for the recovery of metallic oxides from — G. F. Downs, Buffalo, N.Y. U.S. Pat. 1,127,209, Feb. 2, 1915. Date of appl., Aug. 6, 1914.

A CONTINUOUS stream of flue dust is heated progressively in a slightly inclined, rotary kiln, and near the outlet end is subjected to a number of air-blasts by which it is violently agitated and simultaneously nodulised or sintered by heat developed by combustion of the contained carbon.

—W. E. F. P.

Cobalt-silver ores; Process for treating — W. Phillips, Swansea. U.S. Pat. 1,127,506, Feb. 9, 1915. Date of appl., Oct. 7, 1913.

THE raw ore is smelted with iron matte and copper residue to produce argentiferous copper matte and speiss, and the latter is re-smelted with successive fresh portions of iron matte until free from silver and copper. The purified speiss is treated for the recovery of nickel, cobalt, and arsenic, and the argentiferous iron matte smelted with a further quantity of raw ore.—W. E. F. P.

[Lead-copper-nickel] alloy. G. C. Holder, Altoona, Pa. U.S. Pat. 1,127,624, Feb. 9, 1915. Date of appl., May 29, 1914.

AN alloy containing Ni 3—9, Cu 20—30, and Pb 61—77, with or without As 0.25%, Fe and Mn (if present) not exceeding 0.5 and 0.3%, respectively. As much as possible of the nickel is added in the form of Monel metal, the permissible amount of which is determined by the content of iron and manganese.—W. E. F. P.

Catalysing materials [metals]; Method of treating — C. B. Morey, Assignor to Larkin Co., Buffalo, N.Y. U.S. Pat. 1,127,911, Feb. 9, 1915. Date of appl., March 2, 1914.

THE pyrophoric property of a catalytic material is reduced by subjecting the material repeatedly to the successive action of a partial vacuum, a period of rest, and an inert gas, and simultaneous heating.—T. St.

Blast-furnace slag; Manufacture of moulded objects from — E. Risch. Ger. Pat. 275,497, March 2, 1912.

ASPHALTUM is added to molten blast-furnace slag before, during, or after pouring into moulds. The moulded pieces are less brittle than those made from slag alone.—A. S.

Iron; Deposition of — S. O. Cowper-Coles, London. U.S. Pat. 1,127,906, Feb. 9, 1915. Date of appl., Aug. 1, 1914.

SEE Eng. Pat. 12,683 of 1913; this J., 1914, 925.

Metals from ores; [Electrolytic] process of separating — H. A. Wagner, East Orange, N.J., U.S.A. Eng. Pat. 11,371, June 15, 1914.

SEE U.S. Pat. 1,115,354 of 1914; this J., 1914, 1161. The depolarising material may contain manganese dioxide, mercury, and a hydrogen-absorbing agent such as palladium black.

Metallic coating and process of making same. Method of plating or coating with metallic coatings. M. U. Schoop, Hönge, Switzerland, Assignor to Metals Coating Co. of America, Boston. U.S. Pat. 1,128,058 and 1,128,059, Feb. 9, 1915. Dates of appl., Apr. 1, 1910, and Aug. 7, 1911.

SEE Eng. Pat. 5712 of 1910 and Fr. Pat. 126,882; this J., 1911, 291, 1008.

XI.—ELECTRO-CHEMISTRY.

Electric synthesis of colloids. Mukhopadhyaya. See VII.

Rapid drying and preservation of wood by Nodon's electrical process. O. Dantin. See IX.

PATENTS.

Furnace; Electric —. J. G. Marshall, Assignor to Union Carbide Co., Niagara Falls, N.Y. U.S. Pat. 1,127,475, Feb. 9, 1915. Date of appl., April 9, 1913.

Two electrodes are supported adjustably side by side, close together, and extend downwards into the hearth of the furnace. Each is surrounded by a jaw clamp, connected with a pair of closely associated movable conductors. The two pairs of conductors are arranged close to and in non-inductive relation to each other, one member of each pair extending between the electrodes, and these two members are arranged in non-inductive relation to each other. An alternating current transformer is fixed near the base of the hearth, with multiple and interlaced conductors connecting it to the movable conductors.—B. N.

Electrolytic apparatus. I. H. Levin, Newark, N.J., U.S.A. Eng. Pat. 3654, Feb. 12, 1914. Under Int. Conv., May 9, 1913.

See Fr. Pat. 467,945 of 1914; this J., 1914, 971.

Preparation of di-secondary glycols. Ger. Pat. 277,392. See XX.

XII.—FATS; OILS; WAXES.

Mutton tallow; Solidifying point of —. R. Meldrum. Chem. News, 1915, 111, 98—99.

SOLID glycerides were separated from mutton tallow by treatment with ether, and their solidif. pt. determined by Dalican's method, the mass being melted at 80° C. and stirred while cooling to 55° to 47° C., and the thermometer then fixed 1½ in. from the bottom of the tube. The solidifying pt. ranged from 49.7° to 50.3° C., with a rise of 3.4° to 4.0° C. The presence of suspended matter and the method of stirring had no influence on the results, and no secondary stationary point was observed. Erratic variations of the "zero" solidifying pt. (i.e., the temperature to which the thermometer falls before the rise commences) and of the rise were much smaller in the case of the solid glycerides than of the original tallow, this being attributed to the influence of the greater proportion of liquid glycerides in the latter. Such variations do not occur with mixtures of stearic and oleic acids (this J., 1913, 1077). Fluctuations of the m.p.s. of glycerides appear to be due to errors of manipulation, whilst the solidif. pt. is influenced by the speed of crystallisation. Constant results are obtained when a constant amount of substance crystallises per unit of time. Glycerides require supercooling to start rapid crystallisation, and each glyceride appears to have a specific "zero" point of incipient solidification. When glycerides (especially mixtures of solids and liquids) are supercooled, the latent heat of fusion may be insufficient to raise the temperature of the mass to the normal solidif. pt. (see also this J., 1915, 181).—C. A. M.

Fat from animal carcasses. H. Dubovitz. Seifen-siederzeit., 1914, 41, 1026—1027. Z. angew. Chem., 1914, 27, Ref. 655.

The fat obtained in the installation at the Budapest municipal abattoir varies considerably in colour,

composition, and titer value (solidif. pt. of fatty acids). By treatment with powdered charcoal or a mineral decolorising powder, a pale yellow, nearly odourless fat can be obtained. The decolorised fat had the following characters: water, 0.11%; unsaponifiable matter, 0.57%; acid value, 27.5; iodine value, 60.6; saponification value, 196.8; refractive index of fat at 40° C., 1.4599; refr. index of fatty acids, 1.4514; titer value, 39.4° C. It is suitable for soap making, being easily saponified and yielding a pale-coloured soap of good lathering power.—A. S.

Olive oil; Notes on the refining of —. M. Degli Atti. Annali R. Scuola Sup. Agric., Portici, 1913, 11. Annali Chim. Appl., 1915, 1, 75—76.

WHEN the maceration of olive pulp is prolonged unduly, oil is obtained which, although otherwise of good quality, is strongly coloured. Tests with various decolorising agents showed that to decolorise such oil, treatment with 5% of finely-powdered animal charcoal for seven days gives the best results.—A. S.

Sesame oil; Colour reaction of —. A. T. Bosch. Merck's Rep., 1914, 90. Pharm. J., 1915, 94, 321.

A GREEN coloration is obtained when a drop of sesame oil is dissolved in 1 c.c. of ether, benzene, or chloroform and an equal volume of a mixture of 2 vols. of sulphuric acid and 1 vol. of hydrogen peroxide solution added.—T. C.

Fat from the seeds of Nigerian Trichilia. P. Ammann and J. Vuillet. L'Agron. Coloniale, 1914, 2, 34—36. Bull. Bureau Agric. Intell., 1914, 5, 1593—1594. (See also this J., 1914, 147).

SEEDS of *Trichilia emetica* from E. Africa have for a long time been imported into France under the name of "mauraires"; they contain much fat suitable for soap and candle manufacture. The seeds of various species from French W. Africa were analysed, and the best, which were long and orange-coloured, and consisted of 58.2% of kernels and 41.8% of shells, contained 43.7% of fat in the kernels and 51.9% in the shells. These fats were of a light brown colour, and contained respectively 90.3% and 92.0% of fatty acids, of which the melting points were 51.5° C. and 44° C., and the solidifying points 47.2° C. and 40.5° C.; the glycerides solidified at 15°—16° C. and about 13° C. The acidity (as oleic acid) was 2.82 and 3.05% respectively. The annual supply of such seeds would be at least several hundred tons.—E. H. T.

Fat extraction tube; A simple —. C. A. Butt. J. Ind. Eng. Chem., 1915, 7, 130—131.

THE tube is similar to an ordinary filter-tube except that the stem is wider (15 mm.), to allow free passage of the vapour upwards and the condensed liquid downwards. The extraction thimble is placed in the wider part of the tube on a coil of wire or a piece of gauze to allow free passage of the vapours. The tubes have proved more efficient than the usual form.—A. S.

Glycerol [in fats]; New method of determining —. S. H. Bertram. Chem. Weekblad, 1913, 10, 237. Chem.-Zeit., 1914, 38, Rep., 461.

TWENTY grms. of the fat is saponified, the fatty acids liberated with acetic acid and separated, the filtrate neutralised with potassium hydroxide, and organic substances precipitated with lead acetate. The filtrate and washings are diluted to one litre, and 100 c.c. is treated with a large excess of 2 N potassium hydroxide solution and with cold 10% copper sulphate solution until a permanent precipitate is obtained. The liquid

is then filtered, the filtrate acidified with acetic acid, potassium iodide added, and the liberated iodine titrated with *N*/10 thiosulphate solution (1 mol. $\text{Na}_2\text{S}_2\text{O}_3 = 2$ mols. glycerol).—C. A. M.

Candelilla wax. R. Berg. Chem.-Zeit., 1914, 38, 1162—1163.

THE pure red or brown variety of candelilla wax can only be bleached after the addition of large quantities of paraffin wax. It is used for inferior varnishes, for insulating telephone wires, and especially for shoe polishes. The original method of separating the wax by boiling the twigs with water has in some works been replaced by extraction with chloroform. From 2.5 to 6% of wax is recovered, and it is purified by straining and melting in water containing 0.5 to 1% sulphuric acid. From $\frac{1}{2}$ to 2 tons of wax per annum are derived from about 0.4 hectare. Some of the extraction plants have a capacity of about 5 tons a day. The crude grey product contains up to 6.5% water, 3 to 15% dirt, and 0.5 to 1.5% ash, mainly calcium carbonate. The light yellow or brown waxes are probably extraction products. A sample of crude grey wax had: M. pt., 86°—88° C.; acid value, 9.8; and saponif. value, 53.8. Brown wax had the following characters: Sp. gr. at 15° C., 0.9860; m. pt. 68.5°; solidif. pt., 65° C.; refraction at 70° C., 1.4558; acid value, 11.6; saponif. value, 63.1; Buchner value, 5.5; iodine value (Wijs), 57.6; unsaponif. matter, 67.5%, with acetyl value 63.7. *Fatty acids* (29.1%): Neutralisation value, 149.6; mol. weight, 375.1. The high iodine value was due to 19 hours being allowed for the absorption. With 1½ to 3 hours' absorption the iodine value was 11.5, which agreed with recorded values. The unsaponifiable matter contained about 50% of two hydrocarbons (m. pts. 68° and 81° to 85° C. respectively), a small quantity of an alcohol (m. pt. 88° to 89° C.) which did not give the cholesterol reaction, and which was present in the wax as an ester, a non-acetylatable substance (m. pt. 243° C.) which gave a purple red solution with sulphuric acid and acetic anhydride, and about 10% of two cholesterolis which could be separated as acetates (see also this J., 1910, 1021, 1396; 1911, 1296; 1912, 692; 1913, 875).—C. A. M.

Emulsification and detergent action. S. H. Shorter. J. Soc. Dyers and Col., 1915, 31, 61—69.

EMULSIFYING agents either tend to prevent the coalescence of oil droplets, or to cause, for the same degree of shaking, a finer subdivision of the oil. Their action is closely connected with the question of the stability of bubbles and films. Gibbs has proved from thermodynamical considerations that if the addition of a solute lowers (or raises) the surface tension of the solvent, the solute will exist in a higher (or lower) degree of concentration in the surface layers than in the body of the solution. The author has found that the thickening of the surface layers formed by solutions of saponin, peptone, and albumin, proceeds without sign of equilibrium for several weeks. The substance forming the surface layer separates from the body of the solution at a rate practically independent of the thickness of the surface layer already formed, so that the process is thermodynamically irreversible, and therefore outside the scope of Gibbs' theory. Donnan has stated that two droplets of an oil in an emulsion are prevented from coalescing by the formation of a contact layer in which the concentration of the dissolved substance is doubled owing to adsorption; this surface tension effect could, however, only be temporary, as prolonged contact would result in a uniform distribution of the dissolved substance. The author accepts the explanation of emulsification, suggested by Pickering (this J., 1906, 88), that

coalescence is prevented by the quasi-solidity of the surface layer. The most striking examples of emulsification are those which occur when an animal or vegetable oil (e.g., olive oil) is poured on to a dilute aqueous solution of an alkali. The adsorption layer in this case consists of soap; it is plastic, and the cylinder of oil formed extends until it splits into drops. If a soap solution is used in place of alkali, adsorption is extremely slow on account of the slowness with which the colloidal soap particles diffuse into the surface layer; hence in the case of a soap solution a rapid extension of the interface thins the soap layer so that the interface becomes practically "normal." In the case of an alkaline solution, on the other hand, the alkali diffuses rapidly into the surface layer, so that the formation of the adsorption layer of soap keeps pace with the extension of the interface. The practically spontaneous nature of the emulsification by alkali is therefore due to the rapidity of formation and the plasticity of the soap layer. With the same amount of shaking, the emulsions formed in different cases differ widely in the degree of fineness of the droplets, e.g., soap solutions form finer emulsions than solutions of saponin, probably due to the difference in the mechanical properties of the surface layer, a highly rigid surface layer being unfavourable to the fine subdivision of the oil. The stability of an emulsion towards dilution with water depends on the solubility of the adsorbed material in water. Emulsions produced by means of alkali or soap are unstable, whereas, if albumin has been used, drastic treatment only causes the droplets to coagulate without coalescing. This explains the action of substances like gelatin in stabilising emulsions, as many colloids form very stable adsorption layers. The relative parts played by the alkali liberated by hydrolysis and the undercomposed soap solution in producing the emulsification necessary for detergent action is being investigated. It has been found that, although the addition of oleic acid to benzene lowers the tension against water, this addition has practically no effect on the tension against soap solution, indicating that the alkali liberated by hydrolysis has no specific surface action similar to that exerted by ordinary alkali. For many purposes it is desirable that a soap should exert no alkaline effect, and it is possible that experiments on the above lines may be valuable for testing the "detergent neutrality" of a soap—a quality essentially different from chemical neutrality. —F. W. A.

Utilisation of the fish waste of the Pacific Coast. Turrentine. See XVI.

Preparation of Wijs' iodine solution. Dubovitz. See XXIII.

PATENTS.

Oils or fats; Apparatus for use in saturating or impregnating— with a gas or gases. A. H. Charlton, Brentford. Eng. Pat. 1410, Jan. 19, 1914.

SATURATION is effected in a closed rotating drum provided on its inner periphery with blades which break up the oil and bring it into intimate contact with the gas (e.g., hydrogen), which is introduced under pressure through a flexible tube and a reducing valve from a cylinder attached to the drum and moving with it. Steam is admitted to an outer casing of the drum through a passage in one of the trunnions and escapes through the other trunnion. The drum is preferably made to rotate nearly a complete revolution alternately in opposite directions.—C. A. M.

Oil; Flavouring — N. Sulzherger, New York. U.S. Pat. 1,127,545, Feb. 9, 1915. Date of appl., Aug. 31, 1911.

A SMALL addition (3%) of peanut (arachis) oil or other oil of distinctive flavour is added to cottonseed oil or other edible oils or fats to obtain a practically tasteless and odourless mixture.

—C. A. M.

Soap mixture; Manufacture of — H. Wade, London. From A. J. Musselman, Chicago, U.S.A. Eng. Pat. 18,523, Aug. 10, 1914.

FINELY divided soap (1 part) is intimately mixed with sawdust (6 parts) in the absence of heat or moisture to obtain a detergent toilet soap.

—C. A. M.

Soap; Apparatus for the manufacture of — P. Krebitz, Munich, Germany, Assignor to Krebitz Process Co. of America, Aurora, Ill. U.S. Pat. 1,126,787, Feb. 2, 1915. Date of appl., Nov. 14, 1913.

THE apparatus comprises a mixing tank containing an agitator, a reaction tank into which liquid may be drawn from the mixing tank, and a grinding mill receiving solid material excavated from the reaction tank. The granulated material from the mill passes to an elevator which delivers it into a conveyor passing across the top of an extraction tank and discharging into a soap kettle. In the bottom of the conveyor casing is a trap door through which material may be discharged into the extraction tank; a shoot near the bottom of the latter discharges the material again into the boot of the elevator.—C. A. M.

Unsaturated fatty acids and their esters; Process for converting — into saturated compounds. W. J. Mellersh-Jackson, London. From De Nordiske Fæhrker De-No-Fa Aktieselskab, Christiania. Eng. Pat. 21,477, Sept. 23, 1913.

SEE Fr. Pat. 462,905 of 1913; this J., 1914, 324.

Concentration of wool scouring and like liquors and recovery of grease therefrom. Eng. Pat. 13,005. See V.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Lithopone. W. J. O'Brien. J. Phys. Chem., 1915, 19, 113—144.

MANY specimens of lithopone when used as a pigment turn grey when exposed to light and moisture, owing to reduction of the zinc sulphide to metallic zinc. The reaction is not reversible, but the white colour is restored by oxidation of the metal on exposure to air in the dark. Barium sulphate is not a necessary factor in producing the darkening but it favours the reaction by adsorption of the zinc sulphide, causing increased surface exposure. Salts which form soluble zinc salts accelerate the darkening, while those which form insoluble zinc salts retard or prevent it. In patented processes for the prevention of the darkening, an insoluble film is formed around the particles of zinc sulphide, and it is impossible to make a lithopone which will not darken unless there is a protective film of some kind. Effective protection may be afforded by the film of zinc oxide naturally formed in the process of heating the lithopone to dehydrate the precipitated zinc sulphide. Although an excessive proportion of the oxide depreciates the value of the pigment, between 3 and 5%, may be thus formed with considerable advantage as regards stability of colour; quenching the red-hot lithopone in water controls the extent of oxidation, assists the

disintegration of the pigment-mass, and removes most of the soluble salts. The protective film of oxide is removable by boiling with concentrated zinc chloride solution and the sulphide then becomes sensitive to light; sodium chloride has a similar effect in a minor degree. A film of aluminium oxide precipitated from an aluminium salt at the same time as the zinc sulphide, has a protective effect similar to that of zinc oxide; sulphur also protects to some extent.—J. F. B.

Linoleum; Effect of moisture on — W. Storp. Veröffentl. Geb. Militär-Sanitätszw., 1914, 57—76. Chem.-Zeit., 1914, 38, Rep., 480.

WATER-SOLUBLE acids are formed in linoleum in the presence of moisture, their production being checked by the presence of acids and promoted by bases. Hence, moist linoleum, although originally containing only a slight trace of free acid, has a disintegrating action upon marble slabs.—C. A. M.

PATENTS.

Turpentine process. Turpentine-retort. J. G. Gardner, Assignor to Southern Rosin-Turpentine Co., Daytona, Fla. U.S. Pats. (A) 1,124,606 and (B) 1,124,607, Jan. 12, 1915. Dates of appl., March 20 and April 21, 1913.

(A) THE finely divided material is heated in a retort by the downward injection of steam until all air is expelled, and the temperature is then raised until the turpentine begins to separate, when the steam is cut off. Heavier vapours condense within the retort, whilst the lighter pure turpentine vapours are conducted to an exterior condenser. (B) The retort has an annular head with an inner ledge near the top provided with a groove to support the flanged head of the basket in which the material is placed.—C. A. M.

Phenol and formaldehyde; Production of anhydrous reaction products of — F. G. Wiechmann, Assignor to Fenoform Corporation, New York. U.S. Pat. 1,126,926, Feb. 2, 1915. Date of appl., Nov. 28, 1913.

A MIXTURE of phenol and formaldehyde is heated to a temperature below that at which any considerable heat of interaction is produced, the resulting liquid anhydrous product is mixed with a reagent promoting the reaction, and the heating continued until a thick anhydrous syrup practically insoluble in water is obtained. Alternatively the reagent promoting the reaction may be added to the original mixture.—C. A. M.

Fluid-tight joints for shafts and the like of agitators of paint and the like dipping tanks. Eng. Pat. 27,111. See I.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Rubber [trees]; Some notes on the manuring of — H. H. Smith. The Rubber Industry, London, 1914, 58—70.

THE main object to be achieved in manuring rubber is to develop trees of large girth, surmounted with a vigorous and well-balanced crown of foliage of considerable area, but not straggling. The composition of the manure must be suited to the individual case, according as root stimulation, the encouragement of bark formation, or invigoration of leaves and latex is needed. The necessity in most cases of a liberal application of lime before the other manures is referred to, and the composition of various mixtures which have been recommended is given. The following results were obtained with *Manihot Glaziovii* trees planted in 5 plots about 13 ft. x 13 ft. apart, each plot including

about 55 trees. The manures were applied in October, 1911.

| Manure per acre. | | | | | | Period Oct. 1911 to Oct. 1913. |
|--|--|---|---|--------------------------------------|-------|---|
| Potassium sul- phate (14.7% K ₂ O). | Potassium sul- phate (16.5% K ₂ O). | Superphosphate (15% P ₂ O ₅). | Bone meal (23.1% P ₂ O ₅). | Ammonium sul- phate (20.5% N). | Lime. | Weight of dry rubber per tree. |
| lb. | lb. | lb. | lb. | lb. | lb. | grms. |
| 178 | — | 161 | 62 | 187 | — | 218.1 |
| — | 339 | 161 | 62 | 187 | — | 177.7 |
| — | — | 161 | 62 | 187 | — | 199.6 |
| 178 | — | 161 | 62 | 187 | 892 | 193.7 |
| Control plot | | | | | | 143.2 |

—E. W. L.

Rubber; Recommendations by the Rubber Growers' Association for the treatment of latex and curing of
— India-Rubber J., 1915, 49, 292-293.

The recommendations, which are given in considerable detail, relate to the precautions to be observed in the collection and transport to the factory of the latex and scrap, and in its reception, coagulation, and subsequent handling in the factory. In collection and transport, the use of clean and suitably designed utensils, the avoidance of copper, and the need for rapid transport to the factory, are insisted on, and the use of formalin or sodium sulphite to prevent spontaneous coagulation in very dry weather is advocated. The three grades which should be recognised at this stage are (1) clean, uncoagulated latex; (2) lump, coagulated in the cups; (3) rinsings from the cups. In the factory the same cleanliness is necessary; all latex should be bulked, and care exercised in straining it. In preparing pale crepe a solution of $\frac{1}{2}$ lb. of sodium bisulphite in 1 gallon of water should be stirred into 40 gallons of undiluted latex before coagulation. The coagulant consists of (a) for crepe: one part of 98–100% acetic acid in 20 parts water, one part of this solution being added to 50 parts of undiluted latex; (b) for sheet: one part of 98–100% acid in 200 parts water, one part of the solution being added to 5 parts of undiluted latex. In the subsequent processes care is necessary to avoid excessive working of the rubber on the rolls, irregularity in thickness of sheet, irregularity in smoking, oil streaks from the bearings of rolls, dark streaks due to oxidation in the absence of sodium bisulphite, mottling, etc., due to slow drying, tackiness due to exposure of rubber or scrap to sunshine, over-smoking, and the use of oily material for smoke-production. The grading of the finished product should be according to the following classification: (1) Fine sheet, or crepe made from the free latex. (2) Clean light brown crepe, made from lumps which do not pass the strainer, and skinmings. (3) Scrap crepe, made from tree-scrap. (4) Dark crepe, from bark shavings and the lower quality of scrap crepe. Earth rubber and tacky rubber should be packed separately. Instructions for careful packing are also given.—E. W. L.

Latex of wild and plantation Hevea; Observations and comparative tests of — F. Ripean. The Rubber Industry, London, 1914, 124–129.

CONFIRMING the view that the high quality of Brazilian hard cure Para may be due to coagulation by the carbon dioxide present in the smoke employed, the author found that, on coagulating

Hevea latex by means of carbon dioxide obtained by burning charcoal, a product was obtained equal to plantation smoked sheets, whilst freer from the impurities which impart to the latter its dark colour. The process would not be easy to carry out in practice. Good results were obtained by adding a dilute solution of creosote to the latex. Many advantages are claimed for this process. Coagulation should be allowed to occur naturally and not be hastened by heating or by the addition of acids, and the coagulum should not be subjected to any mechanical working.—E. W. L.

Latex of Hevea Brasiliensis; Coagulation of and its bearing on the strength of rubber. N. W. Barritt. The Rubber Industry, London, 1914, 130–136. (See also this J., 1914, 289.)

EXPERIMENTS were made to ascertain whether the influence of the conditions of coagulation on the properties of the protein constituent of the latex may extend, through the protein, to those of the vulcanised rubber. Nine samples of rubber were prepared, in the coagulation of which the concentration of salt (sodium sulphate) and acid (acetic) varied in the coagulating latex from N/1 to N/22, and from N/5 to N/240 respectively. Considerable differences of breaking strain were shown by the vulcanised samples, but no general tendency could be deduced from the results.—E. W. L.

Rubber exports from the Amazon basin in 1914. Board of Trade J., Feb. 25, 1915.

THE exports of rubber from Pará, Manáos, Iquitos, and Ita-Coatiara, *via* Pará, during 1914 were as follows in metric tons:—

| Grade. | To Europe. | To U.S.A. | Total. |
|--------------|------------|-----------|--------|
| Fine | 8875 | 9791 | 18,666 |
| Medium | 1111 | 1646 | 2757 |
| Coarse | 1443 | 5504 | 6947 |
| Cauchú | 4475 | 4378 | 8853 |
| | 15,904 | 21,319 | 37,223 |

PATENT.

Vulcanisation of rubber and production of vulcanised-rubber products. F. Hofmann and K. Gottlob, Elberfeld, Germany. Assignors to Synthetic Patents Co., New York. U.S. Pat. 1,126,460, Jan. 26, 1915. Date of appl., Oct. 16, 1913.

SEE Eng. Pat. 11,530 of 1913; this J., 1913, 1078.

XV.—LEATHER; BONE; HORN; GLUE.

Chestnut wood; The tannin of — L. Bernardini. Annali R. Scuola Sup. Agric., Portici, 1913, 11. Annali Chim. Appl., 1915, 1, 73–74.

THE tannin content of chestnut wood increases with the age of the tree and diminishes gradually from the base of the tree upwards. In trees of the same age the tannin content of wood from different parts does not differ much. The bark is particularly rich in tannin, and the tannin-content is higher in spring than in winter, a difference not observed in the case of the wood.—A. S.

Pine-twig extract. R. Rieder. Ledertechn. Rundschau, 1914, 345–350. J. Amer. Leather Chem. Assoc., 1915, 10, 107–108.

ANALYSES of pine twigs show from 4.37% to 7.03% tannin, and from 4.08% to 4.59% sugar. An

extract of the twigs would be unsuitable for use alone, but in combination with quebracho extract or other extract with a low non-tannin content, it would give good results. Large quantities of extract could be produced from the annual waste from the German pine timber harvest.—F. C. T.

Triacetin; Tanning power of—P. Falcicola. *Annali Chim. Appl.*, 1915, 1, 32—36.

EXPERIMENTS on the laboratory scale and on a small working scale showed that triacetin dissolved in or emulsified with water, or dissolved in aqueous alcohol or alcohol, is capable of tanning calf, lamb, and sheep skins, giving a soft, light-coloured leather resistant to cold water, but, like alum-tanned leather, not resistant to hot water. Tanning proceeds rapidly, the greater part of the triacetin absorbed being taken up in the first few hours. For example, using 500 grms. of triacetin and 5 kilos. of water, 3 kilos. of skin was tanned in 4 hours. The egg yolk in the mixtures commonly employed for alum tannage may be replaced by triacetin (1.5% of the weight of the skins).—A. S.

Glue; A study of various tests upon—, particularly the tensile strength. A. H. Gill. *J. Ind. Eng. Chem.*, 1915, 7, 102—106.

THE viscosity and tensile strength of glue and the results obtained by the jelly test (Lipowitz) bear no relation to one another. Results of determinations of tensile strength show a variation of 10%: minute details for the preparation of the glue solution and wood surfaces, and for applying the glue solution are given, and a machine for holding the joint under pressure during drying is described and illustrated. More concordant results are obtained by soaking absorbent paper in the glue solution and measuring the increase of bursting strength (in a Mullen paper tester) of the treated over the untreated paper (compare Setterberg, this J., 1899, 55); the results are not comparable with the tensile strengths but are useful as a basis for grading different specimens according to quality. (See also Trotman and Hackford, and Watson; this J., 1901, 1072, 1189.)—A. S.

Analysis of lactic acid. Faust. See VII.

PATENT.

Hides; Composition for and process of treating—J. H. Yocum, East Orange, U.S.A. Eng. Pat. 8837, April 7, 1914. Under Int. Conv., April 17, 1913.

SEE Fr. Pat. 470,774 of 1914; this J., 1915, 190.

XVI.—SOILS; FERTILISERS.

American soils; Inorganic composition of some important—W. O. Robinson. U.S. Dept. Agric., Bureau of Soils, Bull. No. 122, Aug. 24, 1914. 27 pages.

SOILS of various textures and degrees of fertility, selected from important agricultural types and from different districts, were analysed, especially for the presence of the rarer elements. Rare earths (0.01—0.08%), Cr (trace to 0.025%), V (0.01—0.08%), Zr (0.003—0.08%), Ba (0.004—0.360%), Sr (0.01—0.11%), Li (traces) and Rb (0.001—0.01%) were found in all the soils examined. The existence of tourmaline in 18 soils and of micas in 24 soils, indicated the presence of boron and fluorine respectively. Molybdenum was detected in two soils, and caesium only in one. The presence and amount of copper, nickel, and cobalt

could not be gauged with accuracy, owing to possible contamination from the analytical utensils. Silica, phosphorus, and manganese are more plentiful in the surface soil, aluminium, iron, and, generally, titanium in the subsoil. The average sulphur content was equivalent to 0.13% SO₂. The mineralogical examination confirmed the conclusion that the more important rock-forming minerals were everywhere present; potassium minerals were particularly abundant, the amount present ranging from 43 to 2000 tons per acre-yard.—E. H. T.

Aldehydes [salicyl-aldehyde] in soils; Harmful effects of—O. Schreiner and J. J. Skinner. U.S. Dept. Agric., Bureau of Soils, Bull. No. 108, Aug. 5, 1914. 26 pages.

EXPERIMENTS with chemically prepared salicyl-aldehyde on wheat, corn (maize), rice, etc., grown in water- and pot-cultures, with and without the addition of nutrients, gave results confirming those obtained with aldehydes isolated from the soil (see this J., 1914, 975). The aldehyde was used in quantities varying from 10 to 200 parts per million, and the toxic effects increased progressively with the quantity used. There was a marked diminution in the amounts of nitrogen, potash, and, to a lesser extent, of phosphoric acid, absorbed by the plants when the aldehyde was present. Calcium carbonate diminished the toxic action on the roots but not on other parts of the plant. Salicyl-aldehyde greatly diminishes the yield of crops in the field; it persists for months, but increased soil-oxidation would probably prevent its formation or accumulation.—E. H. T.

Humus; Formation and decomposition of—and its influence on nitrogen assimilation. F. Löhnis and H. H. Green. *Zentralbl. Bakt.*, 1914, (11.), 40, 52. *Chem.-Zeit.*, 1914, 38, Rep., 589.

OF a number of materials mixed with sand, stable manure was most rapidly converted into humus, followed in the order given by green manure and straw; sugar and turf were only very slightly attacked. Semi-anaerobic conditions were the most favourable. With free access of air a considerable amount of the nitrogen of stable and green manure was nitrified and much free ammonia escaped. On treating the humus with caustic soda solution and hydrochloric acid, most nitrate was obtained from green manure humus and from the humus of stable manure formed with free access of air, whilst the humus of stable manure produced under anaerobic conditions contained considerably less. The humus from straw had the same inhibiting effect on nitrification as the undecomposed straw. The fixation of nitrogen by azotobacter in mannitol solution was favourably influenced by the addition of small amounts of humus, particularly stable dung humus, probably as a result of the improved nutrient medium thus produced.—T. C.

Fish-waste of the Pacific coast (U.S.A.); Utilization of the—for the manufacture of fertiliser. J. W. Turrentine. U.S. Dept. Agric., Bureau of Soils, Bull. No. 150, Jan. 23, 1915. 71 pages. (See also this J., 1914, 270.)

THE salmon-packing industry is mainly conducted in the districts around Columbia River and Puget Sound, also in S.E. and W. Alaska. The waste produced is from 25 to 50% of the original weight of the fish, and for 1913 amounted to 120,000 tons valued at about £375,000 in the United States and 20,000 tons, value £63,000, in British Columbia. The fresh material is quite clean and inoffensive. Alaskan samples gave: H₂O 64.6, N 3.02, P₂O₅ 1.59, and oil 10.43%; or when dry, N 8.65, P₂O₅ 4.44, and oil 28.74%

respectively. The oil is concentrated in the head and the nitrogen in the roe of the fish. The calculated value of the dry, raw waste is about £4 per ton, of which about three-quarters is recovered by the present methods of manufacture. The treatment consists in cooking with steam in upright vertical cylinders, hydraulic pressing of the hot mass into hard cakes, and steam-drying. The 1913 output was 1630 tons of dried scrap and 286,000 gallons of oil, from five working plants. Treated waste contained H_2O 4—5, N $7\frac{1}{2}$ —9 $\frac{1}{2}$, P_2O_5 5 $\frac{1}{2}$ —12, and oil 8—20%. In addition to its use as a fertiliser, it would be suitable for cattle and poultry feed. Glue prepared from it is inferior, but the oil fetches 30 cents (1s. 3d.) a gallon. Detailed suggestions are given for treatment on a very large scale, and it is recommended that during the "off" season, the factories should be used for treating the giant "kelps" which abound on the Pacific coast, and of which some are rich in fertilising constituents. A mixture of fish-scrap and treated kelp would make a valuable compound manure. Small quantities of scrap are produced from herrings, tunas, and whales, and much waste is discarded in the halibut fisheries.

—E. H. T.

Nitrogen of "processed" fertilisers. E. C. Lathrop, U.S. Dept. Agric., Bureau of Soils, Bull. No. 158, Nov. 10, 1914. 24 pages.

The fertiliser investigated was of the "base goods" type, manufactured by the action of sulphuric acid upon nitrogenous organic trade wastes mixed with mineral phosphate. The nitrogen was mainly in the form of primary protein decomposition products, showing that the original protein had been almost completely hydrolysed. The following nitrogen compounds were isolated: lysine, histidine, arginine, leucine, tyrosine, two purine bases, guanine, hypoxanthine, and a proteose-like substance composed of acid amide radicles and monamino- and diamino-acid radicles. Most of these compounds have already been shown to be available and beneficial to plant life. The conclusion is drawn that the water-soluble nitrogen of the fertiliser had an availability equal to, if not greater than, that of the nitrogen of dried blood. The availability of the nitrogen in such "processed" fertilisers is conditioned by the extent to which the original protein compounds have undergone hydrolysis in the course of manufacture.

—E. H. T.

Acid phosphate [superphosphate]: Manufacture of W. H. Waggonman, U.S. Dept. Agric., Bureau of Soils, Bull. No. 114, Dec. 24, 1914. 28 pages.

In the United States, superphosphate is made from the amorphous phosphates found in enormous quantities in Florida, Tennessee, Utah, Idaho, Wyoming, and Montana; smaller quantities come from South Carolina, Arkansas, and Kentucky. Roller mills having a capacity of 10—12 tons per hour are used for crushing the rock so that 80—90% will pass through a 60-mesh sieve; less soluble phosphates are ground so that 80—85% passes through an 80-mesh sieve. The fine material is mixed with about its own weight of sulphuric acid of 50°—55° B. (sp. gr. 1.515—1.596) in a cast-iron revolving pan 4—8 ft. in diameter and 1—2 ft. deep, fitted with a stirring device, and after 2—5 minutes the product is discharged either into a "den" (a closed brick-lined chamber holding 50—300 tons) or conveyed to an open "dump." In the "den" system the reactions are complete in 24—36 hours, and the superphosphate is obtained in a dry, porous state, practically ready for shipment. In the "open dump" method, automatic dump cars carry the product either direct to the storage shed, where open piles are formed, or into a partly open bin,

from which after 8—10 days standing, it is taken up by elevators and put on the storage pile. At least a month must then elapse before it can be shipped. When carefully made, especially by the "den" method, superphosphate seldom requires any subsequent drying, but if, owing to faulty manufacture, it is sticky or wet, small amounts of phosphate rock, limestone, ground peat, or calcined gypsum are added; drying by hot air under pressure is not practised. Storage for long periods in large piles may cause "reversion," i.e., formation of phosphate insoluble in water. It is usually necessary to disintegrate the fertiliser before transporting. Material of good quality is thrown with shovels on to inclined sieves, but inferior material has to be treated in a disintegrating machine. The cost of production of superphosphate containing 16% citrate-soluble P_2O_5 is given as \$6.75—8 (28—33s.) per ton for inland towns; near the coast it is \$6.20—7.50 (26—31s.) exclusive of office expenses. Double superphosphate is made in S. Carolina where low-grade phosphate is mined, the phosphate rock being decomposed into phosphoric acid and calcium sulphate by means of dilute sulphuric acid (16° B., sp. gr. 1.121), the mixture filter-pressed, the phosphoric acid solution concentrated to 56°—58° B. (sp. gr. 1.615—1.653), and then used to convert a further quantity of phosphate rock into monocalcium phosphate (double superphosphate).

—E. H. T.

Basic slag: Comparative analyses of—by the methods of Lorenz, Naumann, and Popp. W. Holle. Chem.-Zeit., 1914, 38, 1083.

ANALYSES of 20 samples of basic slag showed that Naumann's method yields results which are on an average 0.21% higher than those found by the Lorenz method (see this J., 1912, 259); Popp's method (this J., 1912, 811) also yielded results higher (by 0.24%) than those of the Lorenz method. When applied to pure sodium phosphate, the same differences were found in the results obtained by the three methods; the Lorenz method gave the quantity of P_2O_5 required by theory (see also this J., 1911, 1191).—W. P. S.

Fertiliser value of citric-soluble phosphoric acid and potash [from felspar, etc.]; Production and W. H. Waggonman, U.S. Dept. Agric., Bureau of Soils, Bull. No. 143, Nov. 13, 1914. 12 pages.

EXISTING methods of making fertilisers from felspar and phosphatic minerals by fusion with other materials, either involve the loss of much potassium by volatilisation, or are economically unsound owing to the cost of maintaining the high temperatures necessary; moreover, but a small fraction of the valuable constituents is obtained in a form soluble in 2% citric acid. In the method here described, which has been worked out in the laboratory, small amounts of iron oxide (hematite) and manganese dioxide are added to the mixed minerals, in order to lower the melting point and to promote fluidity. The best product was obtained by heating at about 1400° C. for 40 minutes. It contained 7.21% P_2O_5 , and 6.48% K_2O , all of which was soluble in 2% citric acid, and fairly soluble in water saturated with carbon dioxide. Pot tests on wheat seedlings in typical soils demonstrated its fertilising value; though the effects were, of course, inferior to those produced by superphosphate and potassium sulphate.—E. H. T.

Nitrogen: Direct assimilation of atmospheric—by plants. E. Marnelli and G. Pollacci. Atti Istit. Botan. Univ. di Pavia, 1914, 14, 156—257. Annali Chim. Appl., 1915, 1, 67—69.

EXTENSIVE experiments have shown that the property of assimilating atmospheric nitrogen is

not restricted to a particular class of plants, but is exhibited generally by all kinds of chlorophyll-containing plants ranging from phanerogams to algae. The plants were grown in sterilised nutrient media free from nitrogen compounds, and the amount of nitrogen combined was determined by analysis of the plants and, in some cases, by analysis of the residual air. *Azolla caroliniana* and *Salvinia natans* were found to be specially active in assimilating free nitrogen. It is suggested that the nitrogen combines directly with hydrogen in the chlorophyll-containing cells under the influence of an enzyme or a catalyst present therein.—A. S.

Manganese; Influence of — upon [the nitrifying] bacteria of leguminous plants. M. D. Olaru. Comptes rend., 1915, 160, 280—283. (See also this J., 1914, 560.)

NITRIFYING bacteria from the root nodules of leguminous plants were cultivated in a sterilised broth prepared from haricot beans with the addition of 2% of sucrose. To 100 c.c. of this medium, from 0.01—1.0 mgrm. manganese sulphate was added, and after keeping at 19°C. for 48 hours, the gain of nitrogen was determined. The maximum increase, 75.5%, was obtained when 0.5 mgrm. manganese was added, the control showing a gain of 3.3%. Other experiments with a slightly weaker broth, containing less initial nitrogen, and extending over 50 and 114 days, showed that the optimum quantity of manganese was 2.0 mgrm. in each case, and the percentage gains of nitrogen 38.4 and 31.2 respectively; the controls gave 8.8 and 5.6%.—E. H. T.

Sulphur; Action of — on plant growth. T. Pfeiffer and E. Blanck. Landw. Versuchsstat., 1914, 83, 359—383. Chem.-Zeit., 1911, 38, Rep., 506.

SULPHUR neither increases plant growth nor enables the nitrogen in the soil to be utilised more fully. On the contrary, a very small, insignificant, injurious effect was observed.—T. C.

Radioactive substances; Use of — as fertilisers. W. H. Ross. U.S. Dept. Agric., Bureau of Soils, Bull. No. 149, Dec. 11, 1914. 14 pages.

ALTHOUGH useful results may be obtained with radioactive substances in botanical research, and possibly also in greenhouse practice, the utilisation of radioactive materials in general farm work is economically out of the question. To double the amount of radium in an acre-foot of average soil would require 0.75 ton of carnotite, containing 2% U_3O_8 , and costing \$80 (about £16 10s.) per ton. The so-called "radioactive manures" are prepared from the residues left after the extraction of the radioactive elements from the ore, and the quantity usually recommended for application contains only about 1% of the amount of radium normally present in an acre-foot of the soil. The radioactivity cannot be intensified by mixing with farmyard or other manures, because this property is independent of the surrounding medium and of the state of combination of the radioactive element. Much of the research work on this subject has been inexact, and the conclusions drawn from it erroneous and conflicting. Evidence is adduced to show that the action of uranium ore on plant life is due to its chemical and not to its radioactive properties.—E. H. T.

Notes on the manuring of rubber trees. Smith. See XIV.

Influences affecting the protein content of wheat. Shaw. See XIXa.

PATENTS.

Phosphate rocks; Process for rendering available the phosphoric acid in —. A. H. Cowles, Assignor to The Electric Smelting and Aluminium Co., Sewaren, N.J. U.S. Pat. 1,126,408, Jan. 26, 1915. Date of appl., Dec. 24, 1912.

A MIXTURE of potash felspar and calcium phosphate rock (preferably in proportion to contain 2 mols. CaO to 1 mol. SiO_2) is heated to at least a sintering temperature and the product treated with solvents, such as sulphuric acid, which do not produce insoluble phosphates or aluminates.—F. SODN.

Ammoniated acid phosphate [superphosphate] and process of making same. T. L. Willson and M. M. Haff, Ottawa, Assignors to Southern Investment Co. of Canada, Ltd., Montreal. U.S. Pat. 1,127,840, Feb. 9, 1915. Date of appl., June 23, 1913.

ACID phosphate is dried, preferably so as to contain 6—7% of moisture, and treated with ammonia gas to yield a product substantially free from insoluble phosphate.—F. SODN.

XVII.—SUGARS; STARCHES; GUMS.

Sugar beet; Cultivation of — in Norfolk and Suffolk. C. S. Orwin and J. Orr. J. Board Agric., 1915, 21, 969—987.

FROM figures collected by the authors, it appears that the average yield of roots (washed) which has been obtained in Norfolk and Suffolk is 12 tons per acre, and that the total average cost of growing (including cultivation, seed, manure, rent, and rates) is £9 7s. 8d. per acre. It may be assumed that for three or four years the price of sugar will be high owing to the disorganisation of the industry in Germany, France, and Belgium, and if the price of beet be taken as 25s. per ton f.o.r., as it was in 1914, a crop of 12 tons will give the farmer a return of £15 and a profit of £5 12s. 4d. per acre, less the cost of placing the crop on rail. So far, therefore, as the immediate future is concerned there is the prospect of farmers being able to start the industry on a sound and remunerative basis. The scarcity of sugar resulting from the war will, however, probably cease in a few years, and with the increase in supply the price of beet will fall. It is necessary to consider the possible effect of such a contingency on the position of farmers who may have devoted a part of their rotation to beet growing, but during three or four years of high prices farmers would gain experience which should enable them to reduce the cost of growing and to secure a somewhat heavier and steadier yield. They will then be in the position in which they are to-day as producers of corn, wool, and other commodities, in competition with other countries, and there seems to be no reason why they should not hold their own. The authors express the opinion that while the production of sugar in England in relation to the total amount consumed might not be very large, yet, as in the case of wheat, it is in the interests of the consumer that there should be as many sources of supply as possible. It is unnecessary to anticipate the actual circumstances in which a scarcity might arise, but it is well to recognise that scarcity from various causes is not beyond the bounds of possibility.—J. P. O.

Sugar and the war. E. R. Davson. J. Roy. Soc. Arts, 1915, 63, 262—271.

DURING 1913 the sugar imported into England from Germany and Austria amounted to 894,150

and 324,000 tons respectively, a total of 1,218,150 tons, or about 60 % of the total quantity imported; and it is calculated that for the production of this amount 700,000 acres demanding the employment of 350,000 men were required. As a means of encouraging the growth of sugar within the Empire, the author recommends Government support for a sufficient number of years along the following lines: (1) the excise on home-grown beet sugar should still remain unimposed; (2) a sufficiently large sum of money, say £250,000, should be guaranteed for the establishment of a large factory and for the security of farmers raising the necessary quantity of roots, private capital thus being encouraged for the erection of other works when the anticipated success is ensured; and (3) the duty on sugar grown in the British Colonies entering the home market should be withdrawn. In the discussion, C. S. Parker stated that there was no antipathy on the part of British Colonial sugar manufacturers towards the production of beet sugar in England, the belief prevailing that there would be scope for both branches of the industry. J. J. Eastick expressed the opinion that the increase of the area from which sugar might be produced in the British Colonies and at home, with the aid of the scheme proposed by the author, would have the effect of lowering the price.—J. P. O.

Sugar cane; Deterioration of—H. Pellet. Intern. Sugar J., 1915, 17, 80—88.

WHEN cut cane is exposed to the air, the loss of weight is dependent upon the size and straightness of the stalks, the density of the heap, the temperature and the movement of the atmosphere, but it is not always proportional to the degree of deterioration. The deterioration depends largely upon the kind of cane; while one variety may hardly deteriorate at all on exposure, another may show a decrease in purity of 5°—7°, the loss of weight in both cases being about the same. In selecting a suitable kind of cane for propagation, it is necessary to ascertain not only the yield per acre and the sucrose content and purity of the juice, but also the keeping quality after cutting.—J. P. O.

Reducing sugars; Determination of—in cane molasses. J. A. Verret. Intern. Sugar J., 1915, 17, 85—86.

THE results obtained by Munson and Walker's gravimetric method of determining reducing sugars (J. Amer. Chem. Soc., 1906, 663; this J., 1906, 656) are too high if the cuprous oxide be weighed as such, but are more accurate when the cuprons oxide is oxidised to cupric oxide. As a result of a number of comparative experiments carried out by a committee of the Hawaiian Chemists' Association, Peters' modification of the iodide process (J. Amer. Chem. Soc., 1912, 34, 422) is recommended, in which the cuprons oxide obtained by the Munson and Walker method is dissolved in nitric acid, the lower oxides of nitrogen removed by boiling with talcum powder, and the copper in the solution determined volumetrically, after the addition of potassium iodide, by titrating with standard thio-sulphate solution.—J. P. O.

PATENTS.

Sugar juice and similar liquids; Method and apparatus for separating impurities from raw—C. D. van Raalten, Gempolkrep, Java. Eng. Pat. 30,099, Dec. 31, 1913.

THE impure juice is fed on to an oscillating sieve, in the form of a horizontal trough, to which simultaneously a vertical and horizontal oscillating motion is imparted, after the principle of an oscillating conveyor, so that the solid impurities travel over the separating surface, while the clear liquid passes through.—J. F. B.

Evaporation and concentration processes, as in the manufacture of sugar; Apparatus for use in—O. Söderlund, T. Boberg, and Techno-Chemical Laboratories, Ltd., London. Eng. Pat. 3456, Feb. 10, 1914.

IN working evaporating plant of the type described in Eng. Pats. 12,462 and 22,670 of 1911 (this J., 1912, 971; 1913, 183), in which evaporation is maintained by compressing the vapour of the liquid, the power required for driving the compressors is derived from a steam turbine, the exhaust steam from which is utilised for supplying the steam requirements of all the other portions of the installation.—J. F. B.

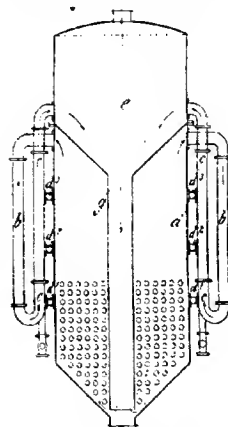
Golden syrup, invert sugars, and glucose; Manufacture of—J. J., J. C. N., and A. G. Eastick, London. Eng. Pat. 5900, Mar. 9, 1914.

INVERT sugar and starch glucose are decolorised by adding decolorising carbon to the acid liquid during the process of inversion, and agitating the liquid in presence of the carbon, preferably by means of a current of air or oxygen. The carbon is separated by filtration and may be revived, and the decolorised filtrate is neutralised.—J. F. B.

Crystallising process for after-product massecuites. L. Hirt. Ger. Pat. 275,126, Jan. 4, 1912.

THE massecuite when leaving the concentrating apparatus, or entering the crystallising vessel, or at some intermediate point, is mixed with a quantity of a diluting liquid sufficient to compensate the supersaturation of the syrup at the crystallising temperature.—A. S.

Massecuite; Apparatus for producing a vigorous circulation of the liquid, especially in vacuum evaporators or the like. E. Lehne. Ger. Pat. 278,587, July 6, 1913.



THE vapours from the evaporating chamber, *a*, pass into the pipes, *b*, and thence into the pipes, *c*, into which liquid from the evaporating chamber also flows through the slide-valves, *d*¹, *d*², *d*³. The mixture of liquid and vapour rises through *c*, into the separating chamber, *e*, where the vapour is evolved, the liquid flowing back into the evaporating chamber through the pipe, *g*.

—A. S.

XVIII.—FERMENTATION INDUSTRIES.

A starch-forming enzyme [hemicellulase] from malt; its action on hemicelluloses and its commercial application to brewing. C. B. Davis. J. Ind. Eng. Chem., 1915, 7, 115—118.

THE author claims to have discovered in malt a new enzyme, hemicellulase, which hydrolyses hemicelluloses, such as granulose, starch cellulose, and amylose, and also amylopectin, pentosans, and hexosans, transforming them permanently into gelatinised starch. Its optimum temperature is 82.5° C., and it is active between 15° and 90° C.

It appears to possess the character of a peptone, in that it is not coagulated on boiling, nor precipitated by zinc sulphate, but precipitated by phosphotungstic acid and by Tanret's reagent. It was isolated by macerating 300 grms. of ground barley malt with 700 grms. of water in presence of 1% of toluene at 60°–70° F. (15.5°–21° C.) for 4½ hours and then heating the expressed liquid (450 grms.) at 81° C. for 5 mins. to destroy the diastase. From the clear filtered liquid (375 c.c. at 21° C.) the enzyme was separated by two successive precipitations with alcohol, and the precipitate was washed with alcohol and ether, dried in a desiccator, extracted with water, and the aqueous extract allowed to evaporate over calcium chloride: the residue (0.0574 gm.) was capable of transforming 1000 times its weight of hemicellulose into starch. Figures are given showing that in mashing barley malt the maximum yield of extract is obtained between 75° and 85° C., i.e. above the temperature at which diastase is destroyed; the worts give a blue starch reaction with iodine. To utilise hemicellulase on a commercial scale, mashing is preferably effected in a water-jacketed machine. The machine is charged with cold water, crushed malt, and raw grain (maize, barley, rice, etc.), and the mash is heated to 80° C., then cooled to below 75° C., and a further quantity of malt added. It is stated that 3.5% more beer is produced than by laboratory methods and 8% more than by the methods at present used on a commercial scale. The grains are not pasty and draining proceeds very rapidly owing to the conversion of the cell walls by the hemicellulase.—A. S.

Ferment [enzyme]; Influence of the hydrogen [ion] concentration upon the optimum temperature of a —. A. Compton. Roy. Soc. Proc., 1915, B, 88, 408–417. (See this J., 1914, 977.)

SOLUTIONS containing constant proportions of maltose and takadiastase, but different concentrations of added acid or alkali, were maintained at various temperatures for 16 hours, and the proportion of maltose hydrolysed was taken as a measure of the activity of the maltase. The optimum temperature was found to vary considerably with the reaction of the medium. The highest optimum, 49° C., corresponded to a concentration of hydrogen ions between $10^{-7.2}$ (the natural reaction of the takadiastase at the concentration employed) and $10^{-6.9}$. When the acidity was raised to $H^{+}=10^{-3}$ the optimum temperature fell to 35.5° C. On the other hand the faintest alkalinity of the medium, corresponding to $H^{+}=10^{-9.3}$, lowered the optimum temperature to about 45° C., but the enzyme was so weakened that the investigation was not extended further in this direction.—J. H. L.

Glycerol; Influence of — on alcoholic fermentation and the inversion of sucrose. G. Rossi. Boll. Chim. Farm., 1914, 53, 657. Annali Chim. Appl., 1915, 1, 81–82.

A CONCENTRATION of 42% of glycerol is necessary to prevent alcoholic fermentation; at lower concentrations than 10% there is no appreciable effect. At a concentration of 50%, glycerol kills the yeast, but does not inhibit the action of the invertase.—A. S.

Wines; Lactic acid in Italian —. C. Mensio and E. G. Canina. Le Staz. Sper. Agrar. Ital., 1914, 47, 385–469. Bull. Bureau Agric. Intell., 1914, 5, 1665–1668.

A STUDY of some of the finest Piedmont wines has shown that the lactic acid content increases with their age, and although at first beneficial, and in certain cases essential, it may become harmful.

The acid is found in all wines (up to 5–6 grms. per litre) and is due to bacteria analogous to *Bacterium gracile* (Müller-Thurgau), which converts malic into lactic and carbonic acids. This fermentation considerably reduces the acidity of the wine. Acidity may be diminished by retarding the racking, by keeping the cellar warm, and by dispensing with sulphurous compounds. Malo-lactic fermentation is of great importance for ordinary wines, particularly when poor in alcohol, and the determination of lactic acid should always be carried out.—E. H. T.

Aniline dyes in wine; Detection of —. F. Wohack. Chem. Zentr., 1914, 1, 1976. Pharm. J., 1915, 94, 321.

(1). A SAMPLE of wine is extracted with amyl alcohol and the amyl alcohol extract warmed on the water-bath with a woollen thread. In presence of an aniline dye the wool is coloured pink and the colour is not changed to green on the addition of ammonia. (2). The wine is shaken with mercuric oxide to remove natural colouring matters, filtered, and made slightly acid with hydrochloric acid, any precipitated mercurous chloride being filtered off, and the solution heated with the addition of a few woollen threads, on which any dye present is fixed.—T. C.

Yeast; Manufacture of pressed or bakers' —. A. C. Reavenall. J. Inst. Brewing, 1915, 21, 97–110.

It is estimated that before the war about 50% of the bakers' yeast used in the United Kingdom was obtained from the Continent. Brewery yeast is considered unsuitable because of its hop-flavour and the slight coloration it imparts to the bread, and ordinary distillery yeast is generally too exhausted to be of service. The manufacture of bakers' yeast therefore constitutes a special branch of the distilling industry in which the alcohol is regarded as a secondary product. The choice of raw materials is a very wide one, certain starchy materials, e.g., maize, being preferably digested in large converters under high steam-pressure. For saccharification a low-kilned or even green malt of high diastatic power is preferred. Malt combs and bran are often added to afford suitable nutrition. The grist, finely ground, may consist of 15–25% of malt and about 20% of barley, rye, oats, or wheat; the mash is set up at 125°–130° F. (52°–54.5° C.) and 50–80% of maize, "converted" in a separate digester, is then added. Mashing is finished at 150° F. (65.5° C.) at a dilution of 3 barrels per quarter, without boiling. An addition of "bub" (a separate mash acidified by lactic fermentation) is made at some suitable stage, to protect the yeast from foreign organisms; this mash is sometimes also employed to bring the pitching yeast into condition. Two methods of yeast-cultivation are in vogue. In the Vienna process the whole mash is fermented, the yeasty skimmings being strained through sieves to remove the grains and allowed to settle. This process gives high yields of alcohol but the yield of yeast is low and it is often weak. In the aeration process the mash is drained, preferably in filter-presses, and the wort collected at a gravity of 1035°. It is pitched at 75°–78° F. (24°–25.5° C.) with a large quantity of strong yeast, and air is pumped through the wash during the whole period of fermentation; powerful attenuating coils are usually provided. The yeast is generally collected in centrifugal separators and the "cream" pressed into cakes. The yields of yeast and alcohol vary reciprocally. The author gives the following numbers taken from practice: Vienna process, pressed yeast 12.5–20.0% of the weight of grist; alcohol, 6.0–8.8 galls. proof

spirit per cwt. Aeration process, pressed yeast, 22.0—35.0%; alcohol, 4.9—5.8 galls. proof spirit per cwt.—J. F. B.

Utilisation of sulphite-cellulose waste lyes, especially for the manufacture of alcohol. Landmark. See V.

PATENTS.

Beer; Apparatus for brewing——. B. A. Koppitz, Detroit, Mich., and P. Sherrer, Cleveland, Ohio. U.S. Pat. 1,127,899, Feb. 9, 1915. Date of appl., Nov. 30, 1912.

The brewing kettle is provided with a steam jacket below the bottom, and steam is supplied to the jacket and then circulated by means of a pump through an external superheater and a coil arranged inside the brewing kettle so as to be wholly submerged and out of contact with the walls.—J. F. B.

Fermentation gases; Apparatus employed for compressing——. J. F. Wittemann, Lakewood, N.J., and R. W. Wittemann, Brooklyn, N.Y. Assignors to Amaranth Machinery and Supply Works, Inc., New York. U.S. Pat. 1,128,265, Feb. 9, 1915. Date of appl., Aug. 25, 1911.

A gas conduit leads from a closed fermentation vessel to a compressor, to which cooling water is supplied by a valve-controlled conduit. The water and gas are discharged from the compressor through a conduit fitted with a thermostat, from which the valve controlling the supply of cooling water is operated. In the discharge conduit means are provided for separating the gaseous products from the cooling water; the gases are led from the upper part of the separator to a gas storage vessel, and the waste cooling water is discharged automatically as it accumulates.—J. F. B.

Apparatus for impregnating liquids with gases [carbon dioxide]. U.S. Pat. 1,128,264. See I.

XIXA.—FOODS.

Milk; Condition of casein and salts in——. L. L. van Slyke and A. W. Bosworth. J. Biol. Chem., 1915, 20, 135—152.

SERUM prepared from fresh milk by filtration through a Pasteur-Chamberland filter is yellow, with a faint greenish tint and slight opalescence; it contains in solution the whole of the lactose, citric acid, potassium, sodium, and chlorine present in the milk, whilst albumin, inorganic phosphates, calcium, and magnesium are partly in solution and partly in suspension. Albumin in fresh milk appears to be adsorbed to a considerable extent by casein, and, consequently, only a part of it passes into the serum; in the case of sour milk, or milk to which formaldehyde has been added, the serum contains practically all the albumin. The insoluble portion of milk, separated as described above, is greyish to greenish-white in colour, of a glistening, slime-like appearance, and gelatinous consistence; when shaken with water it forms a milky suspension which is neutral to phenolphthalein. It consists of neutral calcium caseinate ($\text{casein} \cdot \text{Ca}_2$) and neutral dicalcium phosphate (CaHPO_4); these two compounds are not in combination with each other. By treating fresh milk with formaldehyde and centrifuging, the phosphates may be separated nearly completely from the casein. Both fresh milk and the serum from fresh milk show a slight acid reaction to phenolphthalein, but are strongly alkaline to methyl orange; the acidity is probably due to soluble acid phosphates. The authors suggest the

following as representing the principal constituents of milk: fat, 3.90; lactose, 4.90; proteins combined with calcium, 3.20; dicalcium phosphate (CaHPO_4), 0.175; calcium chloride, 0.119; magnesium phosphate ($\text{MgH}_2\text{P}_2\text{O}_8$), 0.103; sodium citrate ($\text{Na}_3\text{C}_6\text{H}_5\text{O}_7$), 0.222; potassium citrate, 0.052; dipotassium phosphate (K_2HPO_4), 0.230%; total solids, 12.901%.—W. P. S.

Milk; Effects of certain condensing and drying processes used in the preservation of——upon its bacterial contents. S. Delépine. Report to the Local Gov. Board, 1914, Food Report No. 21, I—49.

The total number of bacteria present in mixed cows' milk, such as is usually supplied to town consumers, was found to be considerably reduced when the milk was concentrated or dried by certain methods, e.g. (A) manufacture of sweetened condensed milk, (B) drying of milk on heated revolving cylinders, (C) drying by spraying the milk into a current of hot air. The reduction was greatest in the case of method A and least with method C. In each of the three methods of treatment there was a stage at which the total number of bacteria was much smaller than in the finished article ready for sale; the increase in the final stages was due to the exposure of the product to sources of infection by which bacteria were re-introduced. The reduction in the number of bacteria was almost entirely due to the destruction of *Streptococci*, *Staphylococci*, *Sarcinae*, bacilli of the *B. coli* type, *Streptothrichae*, yeasts, etc. In all three methods the amount of heat to which the milk was submitted was insufficient to destroy several saprophytic and some pathogenic bacteria, and at none of the stages of preparation was the milk found to be completely sterile. Among the saprophytic bacteria, which were invariably found to resist pasteurisation, those most commonly detected were sporing bacilli of the types included under the term *B. mesentericus*; some *Streptothrichae* appeared in certain cases to have survived, but the evidence on that point was not conclusive. Of the pathogenic bacteria, some living tubercle bacilli of bovine origin survived the treatment of method B; method C, which yields a product having a higher total number of bacteria than method B, probably has even less effect on tubercle bacilli. The same bacilli resisted the process of pasteurisation which forms part of method A. The tubercle bacilli, which survived pasteurisation in method A and drying by heat in method B, were still capable of producing progressive tuberculosis in guinea pigs inoculated subcutaneously with milk containing these bacilli, but the course of the disease was very much slower than that of the disease produced by inoculation with the same amount of untreated tuberculous milk. The tuberculosis produced by the heated bacilli was latent or occult for some four weeks; young rabbits fed with milk containing these modified bacilli did not contract tuberculosis. In fixing bacterial standards for preserved milk, the fact of re-contamination during manufacture should be kept in mind; by the exercise of proper care such re-contamination might be almost entirely prevented. If this were done, the total number of aerobic bacteria present should seldom exceed 100 per gram of preserved milk.—W. P. S.

Wheat; Influences affecting the protein-content of——. G. W. Shaw. Univ. California Pub. Agric. Sci., 1913, 1, 63—126. Bull. Bureau Agric. Intell., 1914, 5, 1583—1584.

INVESTIGATIONS, extending over six years, upon the effect of external conditions upon the protein content of wheat, have shown that the chief factor is climate, and particularly the moisture supply in the later stages of growth, excess of moisture

lowering the amount of protein and also accelerating the tendency of the wheat to pass from a glutenous into a starchy condition. Starchy wheat may change to an entirely glutenous condition in a single season, and *vice versa*, according to the seasonal conditions. The protein-content is greater from late-seeded than from early-seeded grain; retardation of growth by cooling of the atmosphere (cold nights) also increases it. The amount of sunshine received by the plant has a direct, if slight, influence upon the protein content, but the latter is practically unaffected by allowing the grain to stand on the straw in the field until fully ripe. The quantity of available nitrogen in the soil is of no practical importance provided it be not below the normal. The deficiency of Californian wheats in protein is not due to soil exhaustion, but to early seeding, the long period of growth, and the use of seeds with a low gluten content.—E. H. T.

Ensilage; The preparation of — F. Samarani. Boll. del Minist. di Agric., 1913, 13, 87—103. Bull. Bureau Agric. Intell., 1914, 5, 1625—1626.

THE changes in grass silage during the first few days in ordinary silos are due to acetic and lactic fermentations. In the acetic fermentation the sugars of the cell-substance are converted into alcohol and carbon dioxide by an intracellular process; the subsequent acidification of the alcohol is due to chemical or physiological action, and not, as in the case of the lactic fermentation, to bacteria. The predominance of acetic acid in normal sour silage is caused by the high temperature (40° — 60° C.), but if the lactic ferment has free sugar at its disposal, it can produce more acid than the acetic ferment. Hence the addition of lactose, in dilute solution, is recommended. By accelerating the production of acid this addition inhibits any further bacterial fermentation, thus preventing putrefaction and the formation of ammonia, butyric acid, etc. The use of mechanical pressure, immediately after stacking, is advocated, for by excluding air, overheating is avoided, the acetic fermentation is reduced, and the lactic fermentation encouraged. Silos fitted with mechanical presses yield a fodder the total free acid of which contains 70% of lactic acid and 20% of acetic acid, whereas with ordinary non-mechanical pressing the proportions are reversed. An experiment on the ensilage of beet slices also showed the necessity of air-exclusion by heavy pressure, and the utility of adding lactose.

E. H. T.

Meats, etc.; Detection of antiseptics [benzoic acid and its derivatives] in preserved — F. Marre. Ann. Falsif., 1915, 8, 16—27.

Two samples of a German preservative sold under the name "Cordia" were found to consist of: (1), a mixture of *m*-dinitrobenzoic acid, cinnamic acid, and sodium chloride; (2), a mixture of sodium chloride, 20, potassium nitrate, 35, and an amino derivative of benzoic acid, 15%. Samples of corned beef, lunch and ox tongues, sausages, ham, and various other tinned or potted meats imported to France from America and Germany were all free from boric acid, formaldehyde, sodium bicarbonate, salicylic acid, and fluorides, but derivatives of benzoic acid were detected in two samples of corned beef, two tins of lunch tongues, and in various makes of sausages. The following method is recommended for the detection of derivatives of benzoic acid in meats, etc. An average sample of 20 grms. is dried completely, mixed with sand, and extracted with benzene or carbon tetrachloride to remove fat. The material is then heated to evaporate the solvent, moistened thoroughly with water, and extracted with hot water. The aqueous extract is shaken with ether,

the ethereal solution evaporated, and the residue dissolved in a small quantity of aniline faintly coloured with magenta, adding water and hydrochloric acid sufficient to dissolve the aniline. The mixture is filtered and the filter washed with water; if benzoic acid was present in the sample, the filter paper is coloured blue owing to the formation of aniline-blue. Benzoic acid may be detected in the presence of nitrates by extracting the meat with water, evaporating the aqueous extract to a small volume, transferring this to a test-tube, and evaporating it to dryness; when the residue is incinerated, an odour of bitter almonds indicates the presence of a benzoic acid derivative. A similar odour is noticed when the alcoholic extract of a meat containing an amino derivative of benzoic acid is evaporated and the residue incinerated.—W. P. S.

Phosphoric acid; Method for the determination of inorganic — in certain tissues and food products. R. M. Chapin and W. C. Powick. J. Biol. Chem., 1915, 20, 97—114.

THE substance is extracted with an aqueous picric acid solution containing a small quantity of hydrochloric acid, and the phosphoric acid in the extract is precipitated as ammonium magnesium phosphate, which is converted into ammonium phosphomolybdate under the conditions prescribed by Lorenz (see this J., 1912, 259). A portion of the substance, containing from 8 to 80 mgrms. P_2O_5 , is ground with 20 grms. of dry sand and then mixed with 200 c.c. of water and 10 c.c. of 2.5N hydrochloric acid; 5 grms. of picric acid is added, the mixture is shaken continuously for 30 minutes, filtered, and 100 c.c. of the filtrate used for the determination. The total volume of the solution is corrected for the amount of water introduced in the quantity of substance taken for the analysis; when this cannot be determined accurately, a known weight of potassium iodide may be added to the total mixture, and a determination of the concentration of this substance in the extract will give the volume of the liquid in which it, and consequently the P_2O_5 , was dissolved. Determinations of phosphoric acid in eggs showed that the inorganic phosphoric acid increases with the age of the eggs; fresh eggs were found to contain 0.062 to 0.070% of inorganic P_2O_5 (calculated on the dry substance), whilst eggs in an advanced stage of decomposition contained 0.414%.

—W. P. S.

Carbon oxysulphide; Detection and determination of small quantities of — in carbon dioxide, [mineral waters,] and well-gases. L. Dede. Chem.-Zeit., 1911, 38, 1073—1075.

CERTAIN mineral waters containing much carbon dioxide, although originally failing to respond to the usual tests for hydrogen sulphide, developed appreciable amounts of that substance upon keeping; the gases from these waters, including one particular specimen of carbon dioxide used commercially for aerating purposes, behaved similarly. The presence of sulphur was established and its amount determined in the original gases by fixation as lead sulphate, according to Dumas's combustion method. No sulphide was produced from dissolved sulphate either in the presence of ferrous bicarbonate or of cork fragments, even after keeping for long periods; its formation is ascribed to the presence of small amounts of carbon oxysulphide in the waters. The decomposition of this substance by water, being a reversible process, occurs very slowly in the presence of carbon dioxide: $CO_2 + H_2O \rightleftharpoons H_2S + CO$. When water containing 0.05% of sodium bicarbonate was saturated with carbon dioxide containing 0.02% of carbon oxysulphide and preserved in stoppered bottles,

the odour of hydrogen sulphide became perceptible after about four days. Carbon oxysulphide was most conveniently detected and determined by aspirating a slow stream of the gas through a Lunge bulb-tube containing a dilute (1:1000) solution of palladium chloride acidified with hydrochloric acid and kept at 50° C.: $\text{COS} + \text{PdCl}_2 + \text{H}_2\text{O} = \text{PdS} + 2\text{HCl} + \text{CO}_2$. In the presence of fairly large amounts of hydrocarbons and other reducing gases which cause the separation of metallic palladium, stronger solutions of palladium chloride (up to 4:1000) were necessary. The precipitate was collected, washed, and dissolved in hot 10–15% hydrochloric acid containing a little potassium chlorate, the bulbs being washed out with the same reagent. The amount of sulphate in the diluted solution was estimated by precipitation with barium chloride. Three successive quantities of 25 litres of the commercial carbon dioxide mentioned above yielded, respectively, 0.0057, 0.0059, and 0.0048 grm. BaSO_4 , corresponding to 0.0029% COS by weight. The gas obtained directly from a well by means of a partially immersed bell-jar and a 25-litre aspirator gave, similarly, 0.0037, 0.0031, 0.0038, 0.0035, and 0.0039 grm. BaSO_4 per 25 litres, corresponding to 0.0019% COS by weight. It is suggested that the change in the physiological action of certain mineral waters upon storing may probably be detected with the gradual amounts of carbon oxy-

quantities of boric acid.
See VII.

Waste of the Pacific Coast.
See XVI.

Bakers' yeast. Reavenall.
XVIII.

Water in organic substances.
Reger. See XXIII.

PATENTS.

Process for making ——. J. M. W. Kitchen, East Orange, N.J. U.S. Pat. 1,127,778, Feb. 9, 1915. Date of appl., Mar. 19, 1914.

At 40°–65° C., the curd is added to the cold water, then mixed with water equal to the volume of curd by the addition of sodium chloride. The curd is freed from butter by washing with hydrochloric acid and casein is washed with water.

Phosphate milk powder; Process for producing same. Casein Co. of America. U.S. Pat. 1,126,734, Feb. 2, 1915. Date of appl., April 16, 1911.

MILK concentrated to about 15° B. (sp. gr. 1.116) is mixed with sodium glycerophosphate in the proportion of 5 parts to every 95 parts of dry milk solids, and the mixture is dried to a solid form.

—W. P. S.

Milk and milk compositions; Method of dehydrating ——. J. M. W. Kitchen, East Orange, N.J. U.S. Pat. 1,127,778, Feb. 9, 1915. Date of appl., Jan. 24, 1914.

STERILIZED milk is added gradually to cereal granules rich in vegetable fat, the mixture being stirred and exposed to dry air at 150° F. (66° C.) during the addition so as to produce a coating of dried milk on the surface of the granules. The mixture is then dried.—W. P. S.

Milk preparation partly or entirely free from carbonates and salts; Manufacture of, a ——. Deutsche Milchwerke, Dr. A. Saner. Ger. Pat. 275,366, Oct. 11, 1912.

WHOLE milk or its equivalent is heated to 80° C. and rendered homogeneous by one of the known methods. It is then curdled by means of acid, for example, by lactic acid fermentation, and the whey separated partly or completely. For use the separated whey is replaced by a corresponding quantity of water.—A. S.

Foodstuffs from sulphite cellulose waste liquors; Process of making ——. J. König, Munster, Germany. U.S. Pat. 1,128,154, Feb. 9, 1915. Date of appl., Mar. 24, 1911.

SEE Fr. Pat. 169,768 of 1914; this J., 1915, 47.

Apparatus for impregnating liquids with gases [carbon dioxide]. U.S. Pat. 1,128,264. See I.

Flavouring oil. U.S. Pat. 1,127,515. See XII.

XIXe.—WATER PURIFICATION; SANITATION.

Bleaching powder and thiosulphate; The reaction between — in the purification of potable waters. H. Strunk. Veröffentl. Geb. Militär-Sanitätsw., 1914, 28–38. Chem.-Zeit., 1914, 38, Rep., 450.

THE products of the reaction between bleaching powder and thiosulphate in the absence of free acid are sulphuric and tetrathionic acids. When thiosulphate is present in moderate excess, half of it is oxidised to sulphuric and half to tetrathionic acid, but in presence of a larger excess of thiosulphate the reaction proceeds irregularly. If free acid, e.g., carbonic acid, is present, less or even no tetrathionic acid is formed. One mgm. of active chlorine requires 0.87 to 1.58 mgrms. of sodium thiosulphate, according to the nature of the water to be purified; any reducing action the water may have must also be taken into account.—T. C.

Hydrogen peroxide; Action of — on metals, and its use for disinfecting instruments. W. Eichholz. Med. Klinik, 1913, No. 31. Chem.-Zeit., 1914, 38, Rep., 511.

PURE hydrogen peroxide solutions do not attack iron and other metals, except silver, but corrosion is induced by the small amount of impurities present in peroxide sold for medicinal purposes. A 3% solution of the pure peroxide should be used for the disinfection of iron, nickel, and copper instruments. The reaction with iron is so characteristic that it can be used as a test for the purity of hydrogen peroxide preparations, provided that pure distilled water and glass vessels which do not yield any alkali are used.—J. H. J.

Firedamp testers. Beckmann and Steglich. See IIa.

Purification of paper mill effluents. Kershaw. See V.

Further applications of the boric acid method [for determining ammonia]. Winkler. See VII.

Detection and determination of small quantities of carbon oxysulphide in carbon dioxide, [mineral waters] and well gases. Dede. See XIXa.

Determination of nicotine in tobacco and tobacco preparations. Baggesgaard-Rasmussen. See XX.

PATENTS.

[Water] filters. J. P. Candy, Sutton, Surrey. Eng. Pat. 27,581, Dec. 1, 1913.

A CYLINDER valve having two connected pistons of different areas and provided with connections

for unfiltered and filtered water, wash water, and waste, is used for controlling the working and washing of the filter. The valve is operated by a system of levers actuated by the difference of pressure between the filtered and unfiltered water, which varies when the filter becomes dirty. When this happens a differential apparatus allows water to flow into a suspended bucket and thereby starts the reversing gear. The filtration is then interrupted and washing takes place; when this is completed the valves are again reversed and filtration proceeds.—W. H. C.

Organic material; Process of preserving — R. D. Elliott, San Francisco, Cal. U.S. Pat. 1,126,430, Jan. 26, 1915. Date of appl., Mar. 9, 1914.

THE material is sterilised by the action of ozonised air, and the air from the sterilising chamber is then circulated through an apparatus containing substances which will absorb ozone, and returned to the chamber. The material is stored in this ozone-free, aseptic atmosphere.—W. P. S.

Determination of substances in gases or liquids [e.g., carbon monoxide in mine air]. Eng. Pat. 250, See XXXIII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Opium alkaloids; Determination of — J. Gsell and B. Marschalkó. Z. anal. Chem., 1914, 53, 673—678. Chem.-Zeit., 1914, 38, Rep., 590.

CODEINE, thebaine, papaverine, narcotine, and narceine can be determined rapidly, with an accuracy at least as high as given by other methods, by determining the amount of methoxyl group present, using the ordinary Zeisel method (this J., 1886, 335).—T. C.

Morphine; Resistance of — to putrefaction. F. Doepmann. Chem.-Zeit., 1915, 39, 69—71.

SEPARATE quantities of 1 kilo. of chopped, lean horseflesh were mixed with 200, 100, 50, and 20 mgrms. respectively of morphine hydrochloride and 200 grms. of the mixture investigated after 1, 2½, 5½, and 11 months. The putrefying mass was thoroughly extracted with very dilute acetic acid, first cold, then warm, and finally on the water-bath. The acid extract was concentrated, precipitated with alcohol, the alcohol-free filtrate precipitated with lead acetate, excess of lead removed by hydrogen sulphide, and the solution concentrated, made alkaline with ammonia, and extracted repeatedly with warm chloroform. The residue from the chloroform extract was dissolved in dilute sulphuric acid and extracted with pure amyl alcohol to remove colouring matters, then made alkaline with caustic soda, and extracted with a small amount of chloroform to remove ptomaine bases, and finally made alkaline with ammonia and repeatedly extracted with warm chloroform. The pale yellow varnish left on evaporating the chloroform gave in every case the characteristic reactions of morphine.—T. C.

Papaver somniferum; The function of the alkaloids of — A. Müller. Arch. Pharm., 1911, 252, 280—293. Chem.-Zeit., 1914, 38, Rep., 596.

THE seeds of *Papaver somniferum* contain no alkaloids until about 14 days after germination. The alkaloid content of the growing plant increases until the accumulation of albumin reserves in the seeds begins after the flowering period. As the seeds ripen the alkaloid content diminishes, so that the alkaloids probably form reserve stores of nitrogen which are subsequently used for albumin

formation and are thus not specific excretory products. (See also this J., 1914, 885).—T. C.

Tobacco; Transformation of the nitrogenous constituents in the curing of — L. Bernardini. Rend. Soc. Chim. Ital., 1914, 6, 223. Annali Chim. Appl., 1915, 1, 76.

DURING the curing of tobacco leaves by direct fire there is a considerable loss of dry substance; about one-fourth of the nitrogenous constituents disappears; the loss occurs mainly in the first stage of the curing. In leaves from mature plants, the nitrogenous constituents, with the exception of nicotine, consist almost entirely of proteins. In the first stage of the curing process the protein content is reduced by about one-third, of which a small fraction is lost, whilst the remainder is found in the form of amino-compounds, asparagine predominating. The transformation of the protein does not proceed further in the second stage of the curing but a small part of the amino-nitrogen disappears. The loss of nicotine is about 22%, mainly in the last stage of the process; the loss during the second stage is three times greater than during the first stage. The content of nitrates is not affected notably, but ammonia—present only in traces in the fresh leaves—is formed in appreciable quantities during the curing.—A. S.

Tobacco and tobacco preparations; Determination of nicotine in — H. Baggesgaard-Rasmussen. Chem.-Zeit., 1915, 39, 25.

TOBACCO and tobacco preparations are extracted with 20% sodium hydroxide solution and then with a mixture of ether and light petroleum. The latter extract, containing the whole of the nicotine, is shaken with dilute hydrochloric acid, and the nicotine is determined by precipitation with silicotungstic acid, the precipitated salt, $20C_{10}H_{14}N_2 \cdot 2H_2O \cdot 12W \cdot SiO_2 + 5H_2O$, being dried at 120° C. and weighed as $2C_{10}H_{14}N_2 \cdot 2H_2O \cdot 12W \cdot SiO_2$.—J. R.

Digitalis preparations; Relative strengths of — R. Robert. Apoth.-Zeit., 1911, 29, 761. Chem.-Zeit., 1911, 35, Rep., 509.

DIGITALIS tinctures prepared from fresh leaves with 96% alcohol are more stable than when prepared by the German official method and also more active in physiological tests. Such tinctures, unlike the official tinctures, in nearly all cases had no haemolytic action. Tinctures prepared from leaves which had been plucked 4 days previously were distinctly less active than those prepared from fresh leaves. Summer leaves are preferable to October leaves. If the leaves must be dried, this should be done *in vacuo* with a rising temperature. (See also this J., 1915, 100).—T. C.

Coumarins; Research on — [Constitution of scopoletin.] G. Bargellini and L. Monti. Gazz. Chim. Ital., 1915, 45, 1, 90—98.

By the action of a persulphate in cold alkaline solution on a phenol, a hydroxyl group is introduced into the benzene nucleus in the para position to the original hydroxyl, or if this position be occupied, in the ortho position. Coumarin, in like manner, when treated with alkaline potassium persulphate yields 5-hydroxycoumarin, whilst 4-methoxycoumarin (the methyl ether of umbelliferone) yields 4-methoxy-5-hydroxycoumarin, the monomethyl ether of ascleutin, identical with that prepared by Tiemann and Will (Berichte, 1882, 15, 2075) by the partial esterification of ascleutin. The other monomethyl ether of ascleutin is scopoletin (see Moore, this J., 1910, 1330; Power and Rogerson, this J., 1912, 45, 290).

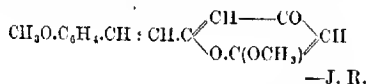
and the authors' work thus affords confirmation of the constitution, viz., that of a 4-hydroxy-5-methoxycoumarin, ascribed to this compound by Moore (this J., 1911, 710).—A. S.

Cinnamein; Optical activity of —. L. Rosenthaler. Schweiz. Apoth.-Zeit., 1914, 52, 273. Chem.-Zeit., 1914, 38, Rep., 453.

CINNAMEIN was isolated from a number of samples of genuine Peru balsam by extracting with ether in presence of caustic soda solution; in most cases the product was dextrorotatory. When 10 grms. of balsam was mixed with 10 grms. of caustic soda solution and 10 grms. of water, and shaken with 50 grms. of ether, the ethereal solutions from *Hardwickia pinnata* balsam, gurgun balsam, Maracaibo copaiba balsam, and Para copaiba balsam had optical rotations of -1.3° , -20.78° , $+0.4^\circ$, and -0.83° respectively.—T. C.

Kava root; Constituents of —. W. Borsche and M. Gerhardt. Riedels Arch., 1914, 50. Chem.-Zeit., 1914, 38, Rep., 472.

IN addition to the resin, gonosan, the root of the kava plant (*Piper methysticum*) contains an alkaloid, an amorphous acid, and a number of glucosides, including the readily purified substances methysticin and yangonin. Methysticin, $C_{15}H_{14}O_5$, is the methyl ester of γ -piperonylene-acetoacetic acid (compare this J., 1908, 708). Yangonin yields *p*-methoxycinnamic acid and anisacetone (or anisaldehyde and acetone) on warming with caustic alkali, and is probably a γ -pyrone derivative of the constitution:



Kava resin in gonosan; Determination of —. L. Hess. Riedels Arch., 1914, 57. Chem.-Zeit., 1914, 38, Rep., 403.

TEN grms. of the sample is distilled with 200 c.c. of saturated sodium chloride solution in a current of steam until drops of oil cease to appear. The oil is extracted from the distillate with ether, the solution dried with sodium sulphate and evaporated, and the residue (which should be about 75 grms.) weighed. It should agree in sp. gr., santalol content, and solubility in 70% alcohol with pure sandal-wood oil. The residue in the distillation flask is extracted with ether, the ethereal solution dried and evaporated, and the residue (about 1.7 grms.) weighed. It should have the odour and taste of kava resin and give a deep red coloration with strong sulphuric acid. Normal pure gonosan contains 80% of sandal-wood oil and 20% of kava resin, whereas by this method only about 75 and 17% respectively are separated, the differences being due to loss and decomposition. Genuine gonosan with 20% of kava resin has a refractive index of 1.5190 at 20°C ; mixtures containing 15%, 1.5158; with 10%, 1.5130; with 4% 1.5087, etc. Samples giving readings outside the limits 1.5060 and 1.5200 may be condemned as adulterated without further examination.—C. A. M.

Lemon oils; Concentrated —. A. Parrozzani. Ann. R. Staz. Sperim. Agrumic. di Acireale, 1914, vol. II. L'Ind. Chim., 1915, 2, 87.

CONCENTRATED lemon oils are frequently adulterated with citral from lemongrass oil; hence the citral content is worthless as a means of judging the quality. The most useful data are the content of terpenes and sesquiterpenes and the ratio of esters to aldehydes.—A. S.

Thymol; The present scarcity of —. Bull. Imp. Inst., 1914, 12, 599—605.

PRIOR to the war ajowan seeds (*Carum copticum*, Benth.) formed almost the sole commercial source of thymol, which was manufactured nearly entirely in Germany. In addition to the possible new commercial sources of thymol mentioned by Umney (this J., 1914, 1073), attention is called to *Ocimum viride*, Willd. ("mosquito plant"), which occurs abundantly both wild and cultivated in all parts of Sierra Leone and also in other parts of W. Africa and in the W. Indies: the oil distilled from the leaves contains up to 65% of thymol. Carvacrol, which is nearly as powerful an antiseptic as thymol (see Martindale, this J., 1910, 1470), is the chief constituent of certain origanum oils (see this J., 1913, 378), and is also present in *Monarda fistulosa*, L. (wild bergamot) oil (52—58%), *Salureia hortensis*, L. oil (38—42%), and *S. montana*, L. (white thyme) oil (up to 65%). The iodide of carvacrol ("iodocrol") is odourless and is estimated to have a bactericidal power five times greater than that of iodoform.—A. S.

Salicylic acid [in presence of salicylic acid]; Determination of —. A. Baldoni. Arch. Farmacol. Sperim., 1914, 18, 1. Annali Chim. Appl., 1915, 1, 65.

SALICYLIC acid when present together with salicylic acid, in urine for example, may be determined by first extracting the two acids together with ether, and then separating them by extraction with chloroform, which dissolves salicylic acid much more readily than it does salicylic acid.—A. S.

Benzoic acid in urine; Determination of —. G. W. Raiziss and H. Dubin. J. Biol. Chem., 1915, 20, 125—128.

ONE hundred c.c. of fresh urine is acidified with 1 c.c. of concentrated nitric acid, then saturated with ammonium sulphate (from 50 to 60 grms. is required), and extracted with four successive portions (50, 40, 30, and 30 c.c. respectively) of pure toluene. The combined toluene extracts are washed twice with 100 c.c. of saturated sodium chloride solution containing 0.05% of concentrated hydrochloric acid, and the benzoic acid in the toluene solution is titrated with N/20 sodium ethoxide, using phenolphthalein as indicator. The sodium ethoxide is prepared by dissolving 2.3 grms. of metallic sodium in 2 litres of absolute alcohol. Four analyses of human urine by this method showed the absence of benzoic acid. Hippuric acid, if present, is not extracted by toluene.—W. P. S.

Benzaldehyde; Alleged existence of an optically active —. G. Bredig and M. Minaeff. Chem.-Zeit., 1915, 39, 73.

THE so-called optically active benzaldehyde stated by Erlenmeyer to be formed when benzaldehyde is boiled with an alcoholic solution of tartaric acid, consists of a mixture of ordinary benzaldehyde with a small amount of a compound of benzaldehyde and tartaric acid to which the optical activity is due. This compound can be removed from the optically active mixture by hydrolysing with sulphuric acid or separated by treatment with sodium bisulphite which combines with the benzaldehyde.—T. C.

Pharmaceutical products of which the Patents have expired. Chem. and Drug., Jan. 30, Feb. 20, Feb. 27, and Mar. 6 and 13, 1915.

THE following are particulars of some recently expired British patents, given in alphabetical order of the trade names.

Acocine. Di-*p*-anisyl-monophenetylguanidine hydrochloride (local anæsthetic). Patent 24,287 of 1897. Prepared from carbon bisulphide or a thiourea and aminophenol, with or without the use of a desulphurising agent.

Airol. Bismuth oxy-iodogallate (substitute for iodoform). Pat. 22,902 of 1894. Obtained by heating bismuth oxyiodide with gallic acid or by treating bismuth gallate with hydriodic acid.

Alumutol. Aluminium naphtholsulphonate (astringent and mild antiseptic). Pat. 10,668 of 1892. Produced by the action of aluminium sulphate on the barium salt of β -naphtholdisulphonic acid R.

Argentamin. Ethylenediamine silver nitrate (antiseptic and astringent). Pats. 8429 of 1893 and 10,845 of 1900. Silver nitrate is added to an aqueous solution of ethylenediamine and the gelatinous product is dried.

Argonin. Silver-casein. Pat. 22,191 of 1894. A salt of casein is treated with silver nitrate solution.

Aristolochin. Carbonylquinine (medicinal properties similar to quinine, but tasteless). Pat. 16,564 of 1898. Obtained by the action of phosgene on quinine.

Aristol. Dithymol iodide. Pat. 5079 of 1889. Thymol is treated with iodine and an alkali iodide in presence of alkali.

Benzosol or **Phthiosol.** Guaiacol benzoate (intestinal antiseptic; also in incipient phthisis). Pat. 5366 of 1890. A salt of guaiacol is heated with benzoyl chloride or benzoic anhydride.

Chinaphenin. Phenetidide-quinine carbonic ester. Pat. 22,285 of 1899. *p*-Phenetidine is treated with phosgene and the product is combined with quinine.

Chloralamide or **Chloralformamide** (hypnotic). Pat. 7391 of 1889. Obtained by the action of chloral on formamide.

Creosotal. Creosote carbonate. Pat. 19,074 of 1890.

Dermatol. Bismuth subgallate (dusting-powder, and for diarrhoea, etc.). Pat. 6234 of 1891. Neutral bismuth nitrate is dissolved in dilute nitric acid, gallic acid is added, the solution is neutralised and the salt precipitated by means of sodium acetate.

Duodal. Guaiacol carbonate (used in phthisis, typhoid, and rheumatoid arthritis). Pat. 19,074 of 1890. Guaiacol is treated with phosgene.

Eucaine. Benzoyl-vinyldiacetonalkamine (local anæsthetic). Pat. 20,697 of 1896. The vinyldiacetonalkamine obtained by reduction of vinyldiacetonamine, is crystallised from benzene or ether, or its hydrochloride is extracted with absolute alcohol. The base of m. pt. 133° C. is benzoylated (see also this J., 1915, 150).

Eumydrin. Methylatropine nitrate (mydriatic). Pat. 25,804 of 1891. A solution of atropine in methyl alcohol is heated with methyl nitrate.

Euphtalmin. Phenylglycolyl-N-methyl- β -vinyldiacetonalkamine hydrochloride (mydriatic). Pat. 20,697 of 1896. A mandelic acid derivative of β -eucaine.

Euquinine. Quinine ethylcarbonate ("tasteless quinine"). Pats. 4991 of 1896 and 22,639 of 1899. Quinine is treated with a solution of chloroformic ethyl ester in benzene.

Europken. Isobutyl- α -cresyl iodide (substitute for iodoform). Pat. 18,021 of 1890. Isobutyl-cresol is treated with iodine and alkali iodide.

Ferratin. Sodium ferri-albuminate (used in anæmia and chlorosis). Pats. 818 and 15,711 of 1895. Obtained from albumin and iron tartrate.

Feropyrine (**Ferripyrene**). Antipyrine ferric chloride (hemostatic and astringent). Pat. 2656 of 1895. Antipyrine and ferric chloride are allowed to interact in aqueous solution.

Guajasanol. Diethylglycocol guaiacol hydrochloride (deodoriser, and for tuberculous diarrhoea). Pat. 23,435 of 1898. Chloroacetylguaiacol (obtained

from guaiacol, monochloroacetic acid, and POCl_3 is mixed with diethylamine, and the product is treated with soda solution and extracted with ether.

Hedonal. Methylpropylcarbinol urethane (hypnotic). Pat. 18,802 of 1899. Methylpropylcarbinol is heated under pressure with urea nitrate.

Hetokresol. Cinnamyl-*m*-cresol (dusting powder in surgical tuberculosis). Pat. 9713 of 1898. A mixture of *m*-cresol, cinnamic acid, and phosphorus oxychloride is heated in presence of an indifferent solvent.

Ichthalbin. Ichthyol albuminate (for eczema and in nervous intestinal affections). Pat. 11,341 of 1897. Albumin and ichthyol are condensed together in presence of sulphuric acid.

Ichthyol. Ammonium sulpho-ichthyolate (for rheumatism and skin affections). Pat. 10,523 of 1884. Obtained from the sulphonation product of shale oil, etc.

Iodoformogen. Iodoform albumin (antiseptic for wounds). Pat. 18,178 of 1897. A solution of iodoform in alcohol and ether is added to an aqueous-alcoholic solution of albumin.

Iodopyrine. Antipyrine iodide (analgesic). Pat. 19,576 of 1890. Potassium carbonate and iodine are added successively, in small quantities, to a boiling solution of antipyrine.

Iodolen. Tetra-iodopyrrole-albumin (wound dressing). Pat. 16,353 of 1899. An alkaline solution of tetra-iodopyrrole is added to an aqueous solution of albumin and the mixture is immediately neutralised.

Iodothyryne. Thyro-iodine (used in myxoedema, etc.). Pats. 12,295 and 20,827 of 1895 and 9576 of 1896. A product of the thyroid gland.

Lactophenin. Lactylphenetidide (analgesic and antipyretic). Pat. 12,166 of 1892. Obtained by heating *p*-phenetidide lactate.

Organic products; New British.—

THE "British and Colonial Druggist," in its issue of Feb. 26th, 1915, states that there is evidence of British firms producing large or small quantities of the following:—Acetanilide, acetylsalicylic acid, anidol, anethol, benzaldehyde, citral, citronellol, cocaine, β -eucaine, eugenol, formaldehyde, hexamethylenetetramine, methylsulphonal, phenacetin, quinal, salicylic acid, salvarsan, sodium salicylate, sulphonal, terpineol, thymol, triacetin, vanillin.

Azolisation by chloroamine. Forster. See III.

Constitution and synthesis of scutellarein. Bargellini. See IV.

Further applications of the boric acid method for determining ammonia. Winkler. See VII.

Tests for determining suitability of glass for medicines. Kroeber. See VIII.

PATENTS.

Menthol cones and the like; Manufacture of. W. A. Whatmough, Surbiton. Eng. Pat. 10,185, April 24, 1914.

MENTHOL is melted, mixed with not more than 10% of a natural wax, fat, oil, or fatty acid, or fatty alcohol or ester, and the mixture is moulded. —W. P. S.

Alcohols [glycerol]; Method of condensing polyhydric. H. Hibbert, Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,126,467, Jan. 26, 1915. Date of appl., Dec. 5, 1913.

A LIQUID polyhydric alcohol, e.g., glycerol, brought into contact with iodine and then heated under reduced pressure.—W. P. S.

Glycols; Preparation of di-secondary —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 277,392, May 6, 1913.

DI-SECONDARY glycols are obtained by the electrolytic reduction of saturated aliphatic aldehydes at metallic cathodes in an acid medium.—A. S.

Alkylaminoacidylcatechols; Preparation of —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 277,540, June 6, 1913.

ARYLSULPHONIC acid halides are allowed to act upon salts of aminoacidylcatechol ethers and alkali carbonates, in presence of an inert solvent, such as acetone, water being added gradually as the reaction progresses. The resulting arylsulphamino-derivatives are alkylated and the arylsulphoalkylaminoacidylcatechol ethers separated.—A. S.

Acetylsalicylic acid chloride; Preparation of —. R. Wolfenstein. Ger. Pat. 277,659, Dec. 20, 1911.

ACETYLSALICYLIC acid is heated with a solution of thionyl chloride in benzene or other inert solvent, preferably at the boiling point of the mixture, until evolution of hydrochloric acid and sulphur dioxide ceases.—A. S.

Glycerol-halogenhydrins and esters of polyhydroxy-fatty acids; Preparation of —. A. Grün. Ger. Pat. 277,901, Oct. 10, 1913. Addition to Ger. Pat. 272,337.

THE reaction between triglycerides of hydroxy-fatty acids and hydrohalogen acids described in the chief patent (this J., 1914, 467) may be effected at atmospheric pressure.—A. S.

Ethers; Preparation of —. Chem. Werke vorm. H. Byk. Ger. Pat. 278,777, May 31, 1911.

ALCOHOLS in the form of vapour, or ethylene hydrocarbons mixed with water and/or alcohol, are led over heated alum. The reaction proceeds at a lower temperature than when alumina is used as catalyst. When ethyl alcohol or ethylene is used, the reaction product is a mixture of ether and alcohol containing 25–50% ether; the alcohol can be recovered and again subjected to the treatment.—A. S.

4-Aminomethylquinolines; Manufacture of —. Verein. Chininfabr. Zimmer und Co. Ger. Pat. 279,193, March 6, 1913.

4-AMINOMETHYLQUINOLINES, useful for therapeutic purposes and for the preparation of other pharmaceutical products, are obtained by reducing nitriles of the quinoline series by the usual methods.—A. S.

Esters of hydroxybenzoyl-o-benzoic acids, their homologues and substitution products; Preparation of —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 279,201, July 12, 1913. Addition to Ger. Pat. 269,336 (this J., 1914, 277).

ALKYL esters of 3-hydroxybenzoyl-o-benzoic acid, its homologues, or substitution products, with the exception of the methyl ester, are obtained from the corresponding derivatives of 3-aminobenzoyl-o-benzoic acid by introducing a hydroxyl group in place of the amino group by the usual methods. This method is preferable to that described in the chief patent (*loc. cit.*) for the compounds in question, since 3-aminobenzoyl-o-benzoic acid can be readily obtained and easily esterified.—A. S.

Lobelia; Process for obtaining the total alkaloids of —. Chem. Werke vorm. H. Byk. Ger. Pat. 279,553, July 15, 1913. Addition to Ger. Pat. 267,219.

THE process for extracting the total alkaloids of *peccanania*, described in the chief patent (this J.,

1914, 43), is applied to the *lobelia*. The alkaloids are preferably recovered as hydrochlorides, using chloroform or the like as solvent.—A. S.

Lymphs for inoculation against certain infectious diseases; Preparation of sterile —. Heirs of A. Jaeger. A. Jaeger, I. Jaeger, F. Flehn, and G. Günther. Ger. Pat. 279,693, Jan. 9, 1912.

BACTERIA adhering to and contaminating the lymph are destroyed by treatment with acetone.—A. S.

Alkali salts of the 3,3'-diamino-4,4'-dioxysarbenzene combined with silver and process of making same. P. Ehrlich and P. Karrer, Frankfurt, Assignors to Farb. vorm. Meister, Lucius, und Brüning, Höchst, Germany. U.S. Pat. 1,127,603, Feb. 9, 1915. Date of appl., Jan. 27, 1914.

SEE Eng. Pat. 1217 of 1914; this J., 1914, 942.

Manufacture of selenofluoresceins. Ger. Pat. 279,549. See IV.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

PATENTS.

[Photographic] *particoloured screens; Methods of making* —. C. L. A. Brasseur, Orange, N.J., U.S.A. Eng. Pat. 28,631, Dec. 11, 1913.

A TRI-COLOUR element of plastic material such as celluloid, is produced either by cementing together strings of the three different colours, or more easily by cementing together three coloured sheets and then making transverse sections. These elements are then assembled lengthwise and cemented together by pressure. Sections are cut at right angles to the length of the elements. Uniform screens are thus obtained, irregular in pattern, but without aggregations of grains of the same colour. For the production of long lengths of such film for cinematograph use a cylinder is built up of blocks of tri-colour elements, the length of the elements being arranged radially; a continuous section is then cut from the surface of the cylinder by a veneering machine or similar appliance.—B. V. S.

Sensitising composition for photographic paper. F. I. Rubricius, New York. U.S. Pat. 1,126,872, Feb. 2, 1915. Date of appl., May 31, 1913.

THE sensitising solution contains ferric ammonium citrate, gum arabic, citric acid, silver nitrate, uranium nitrate, and alcohol.—B. V. S.

XXII.—EXPLOSIVES; MATCHES.

PATENTS.

Explosive. A. B. Cole, Bloomsburg, Pa. U.S. Pat. 1,126,401, Jan. 26, 1915. Date of appl., July 2, 1913.

AN explosive yielding no material excess of oxygen, carbon, or hydrogen, is prepared by mixing granulated sugar (25%), finely-divided carbonaceous mineral matter (22%), potassium chlorate (30%), sodium nitrate (20%), wood alcohol (2%), potassium permanganate (0.5%), and lamp black (0.5%).—C. A. M.

Match; Waterproof—and method of making same. F. van Dyke Cruser, Barberton, Ohio, Assignor to The Diamond Match Co., Chicago, Ill. U.S. Pat. 1,127,410, Feb. 9, 1915. Date of appl., Feb. 17, 1914.

A GELATINOUS ingredient is mixed with the match composition, and the match heads are subsequently exposed to formaldehyde vapours or solution to produce an insoluble and waterproof coating.—C. A. M.

XXIII.—ANALYTICAL PROCESSES.

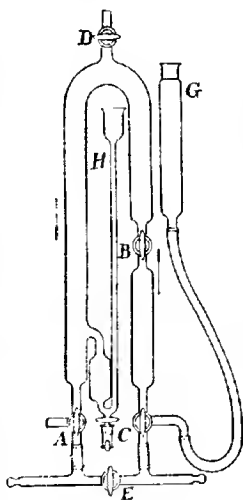
Gases; Determining the specific gravity of—and correcting the volume to normal. M. Hofsäss. J. Gasbeleucht., Jan. 30, 1915. J. Gas Lighting, 1915, 129, 388—389.

Specific gravity. The apparatus (see fig.), for the continuous control of the gas passing through a main, depends on the Bunsen effusion principle and consists of an inverted U-tube, closed by taps, A and B, and having attached to one limb a pressure gauge, H, and, at the bend, a tap, D, in the bore of which is the effusion orifice. The ends of both limbs communicate with a horizontal tube in the middle of which is a tap, E, this tube being connected with the gas supply so that when E is closed and A, B, and C open, gas flows through the apparatus in the direction of the arrows. To make a determination, E is opened and A and B closed, thus trapping gas at the pressure in the main in the space between A and B; D is now opened and the time required for the liquid in the pressure gauge to fall from an upper to a lower mark observed. If necessary the liquid in the gauge may be raised to the upper mark by the aid of the levelling vessel, G. The lower mark of the pressure gauge is adjustable, and is set so that the time of efflux of air is exactly 1 minute, the density of the gas, relative to air, being then equal to the square of the time of efflux of the gas, in minutes. The effect of temperature on the accuracy of the determination is negligible for variations of from 3° to 5° C.; otherwise the lower mark on the gauge must be set for air at the temperature required. To allow of re-setting without stopping the flow of gas, A and B are three-way taps by means of which the U-tube may be put in communication with the atmosphere.

Correction of volume to normal. A chart is given for correcting volumes of gas (measured saturated) and calorific powers, to 0° C. and 760 mm., dry, which may be used in place of the ordinary tables.—W. E. F. P.

Fractional distillation with regulated stillheads. I. M. A. Rosanoff and C. W. Bacon. J. Amer. Chem. Soc., 1915, 37, 301—309.

The vapour from the still was passed upwards through the closed annular space between the



walls of a large, double-walled cylinder of tinned copper, contained in a thermostat. Consecutive fractions were collected and examined in the manner previously described (see this J., 1914, 1027). Mixtures of carbon bisulphide and acetone, ethyl iodide and ethyl acetate, and chloroform and acetone were investigated; with the first two mixtures the boiling-point curve passes through a minimum and with the third mixture through a maximum. The stillhead had no effect when its constant temperature was above that of the boiling-point of the liquid in the still; in every other case the liquid furnished a series of fractions of constant composition, in agreement with that point on the dew (vapour-composition) curve corresponding to the temperature of the stillhead. For instance, with the stillhead at 40.02° C. a mixture of carbon bisulphide with a small proportion of acetone gave seven successive fractions containing 75.1 mols. % CS₂, while a similar mixture with 71% of acetone gave 15 successive fractions having 53.4 mols. % CS₂.—J. R.

Pyrometer; A new optical—W. Allner. J. Gasbeleucht., 1913, 56, 1145—1150. Chem. Zeit., 1914, 38, Rep., 469.

A RADIUM preparation replaces the electric lamp as the standard source of light, and calibration is accomplished by means of a gas-heated, absolutely black substance, the temperature of which is ascertained with a platinum-rhodium thermometer. Results were obtained in good agreement with those yielded by a Wanner pyrometer.—J. R.

Copper titrations; Economy and rapidity in—E. A. Slagle. Eng. and Min. J., 1915, 99, 285.

In the iodide method, the nitric acid solution of the copper is neutralised by the addition of zinc acetate (instead of sodium carbonate, followed by acetic acid) and the titration then conducted as usual, the end point under these conditions being "permanent" for only 5—10 mins. The mixed lead and copper iodides may be recovered from the solutions by precipitation with lead nitrate in the presence of an excess of sodium thiosulphate.—W. E. F. P.

Aluminium associated with iron; The separation and determination of—by the action of acetyl chloride in acetone. H. D. Minnig. Amer. J. Sci., 1915, 39, 197—200.

ALUMINIUM chloride can be quantitatively precipitated and separated from ferric chloride in concentrated aqueous solution by adding, with stirring, a mixture of four parts of acetone with one of acetyl chloride; about 15 to 20 c.c. of the mixture is required for 0.02 gm. Al₂O₃. The precipitate is washed with the precipitating mixture in a perforated crucible, dried, and ignited to convert the chloride into oxide. The iron may be estimated in the filtrate by diluting with water and precipitating with ammonia. If the acetyl chloride contain phosphorus compounds, aluminium or ferric phosphate may be formed, causing high results. Acetyl chloride free from phosphorus compounds may be prepared by passing a rapid stream of hydrogen chloride through a mixture of glacial acetic acid and phosphorus pentoxide or, preferably, through purified acetic anhydride at 100° C. Phosphorus compounds are removed readily from acetic anhydride by distillation over anhydrous sodium acetate.—W. C. H.

Sulphur; Determination of—in organic substances [coal, coke, foods, etc.]. A. Krieger. Chem. Zeit., 1915, 39, 22—23.

A MODIFICATION of the method of Holliger and Dennstedt (this J., 1909, 357; also Z. angew.

(Chem., 1909, 33, 677) is recommended for the determination of sulphur in coal and coke. The weighed sample (0.5 to 1 grm.) is distributed throughout the combustion boat, which is preceded in the combustion tube by a 10 cm. copper spiral; the customary packing of platinum scrap is replaced by a 10 cm. layer of flint. Combustion is effected in a stream of oxygen, the copper spiral and the flint being kept at a dull red heat. The resulting sulphuric acid is absorbed in $N/5$ sodium hydroxide solution and estimated volumetrically. The heating of the boat is so regulated that an excess of oxygen is continuously recognisable in a sodium hydroxide wash-bottle following the absorption apparatus. In the presence of lime, small amounts of sulphur are retained in the ash, e.g., 0.03 to 0.05% in a coal containing 0.20% CaO . For organic substances, plants, and foods, oxidation with concentrated nitric acid is preferable to the above process. The dried substance (1 grm.) contained in a 400 c.c. Kjeldahl flask is well mixed with nitric acid (20 c.c. of sp. gr. 1.18) and dissolved by heating over a small flame, whereupon the acid is partially removed by boiling. The residue is diluted with hot water (200 c.c.), filtered, and precipitated while hot with barium chloride. The barium sulphate is collected and weighed. Silica is not dissolved from plant materials under these conditions.—J. R.

Wijs' iodine solution; Preparation of —. II. Dubovitz. Chem.-Zeit., 1914, 38, 1111.

To prepare Wijs' $N/5$ iodine monochloride solution, 7.8 grms. of iodine trichloride and 8.5 grms. of iodine are required per litre. Most standard text books, copying an error (corrected in the last edition) in Lewkowitsch's book, prescribe 9.4 grms. of iodine trichloride and 7.2 grms. of iodine per litre; the solution thus prepared is much less stable than that containing the correct amounts. —C. A. M.

Comparison of various modifications of the Kjeldahl method with the Dumas method of determining nitrogen in coal, with notes on errors in the Dumas method due to nitrogen evolved from the copper oxide. Fieldner and Taylor. See 11A.

Firedamp testers. Beckmann and Steglich. See 11A.

Determination of gasoline vapour in air. Burrell and Robertson. See 11A.

Determination of benzol in gas. Krieger. See 11A.

Determination and drying of bitumen and other viscous substances. Bornemann. See 11A.

Determination of the degree of "ripeness" of viscose. Hottenroth. See V.

Volumetric determination of free sulphurous acid. Sander. See VII.

Analysis of lactic acid. Faust. See VII.

Determination of small quantities of boric acid. Halphen. See VII.

Further applications of the boric acid method [for determining ammonia]. Winkler. See VII.

Detection of bromides in presence of thiocyanates, cyanides, and ferrocyanides. Curtman and Wikoff. See VII.

Methods of analysis of sulphur. Levi. See VII.

New reaction of free oxygen. Binder and Weinland. See VII.

Experiments with de Nolly's apparatus for the determination of carbon [in iron and steel]. Lepsoe. See X.

A simple fat extraction tube. Buttl. See XII.

Colour reaction of sesame oil. Bosch. See XII.

New method of determining glycerol [in fats]. Bertram. See XII.

Comparative analyses of basic slag by the methods of Lorenz, Naumann, and Popp. Holle. See XVI.

Determination of reducing sugars in cane molasses. Verret. See XVII.

Detection of aniline dyes in wines. Wohack. See XVIII.

Detection of antiseptics [benzoic acid and its derivatives] in preserved meats, etc. Marre. See XIXA.

Determination of inorganic phosphoric acid in certain tissues and food products. Chapin and Powick. See XIXA.

Detection and determination of small quantities of carbon oxysulphide in carbon dioxide, [mineral waters,] and well gases. Dede. See XIXA.

Action of hydrogen peroxide on metals and its use for disinfecting instruments. Eichholz. See XIXB.

Determination of opium alkaloids. Gsell and Marschalko. See XX.

Determination of nicotine in tobacco and tobacco preparations. Baggesgaard-Rasmussen. See XX.

Determination of kauri resin in gonosan. Hess. See XX.

Determination of salicylic acid [in presence of salicylic acid]. Baldoni. See XX.

Determination of benzoic acid in urine. Raiziss and Dubin. See XX.

PATENT.

Gases or liquids; Determination of substances in — [e.g., carbon monoxide in mine air]. J. Harger, Gateacre, Lancs. Eng. Pat. 250, Jan. 5, 1914.

The method consists essentially in converting the substance to be determined into or replacing it by an equivalent quantity of an acid or alkali, and passing a solution of this through a small primary cell provided with a galvanometer. To determine carbon monoxide in mine gases, etc., the gas is passed through bromine-water, potassium hydroxide, sulphuric acid, or phosphorus pentoxide, and then brought into contact with iodine pentoxide heated to 150° – 176° C.; the liberated iodine is collected in arsenious acid solution which is passed through the cell. The apparatus is calibrated so that a zero reading is given for the potential difference of the electrodes in the arsenious acid solution before the iodine is introduced. The iodine pentoxide may be heated by placing it in a tube in the space between the ganze and the bonnet of a miner's safety lamp of modified form. Substances other than carbon monoxide may be determined in a similar way after they have been absorbed in suitable solutions. The galvanometer may be connected with an alarm device adapted to operate when a predetermined amount of substance is present in a gas. (Reference is directed in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907 to Eng. Pats. 14,342 of 1903 and 1776 of 1913; this J., 1903, 1085; 1913, 1171.)—W. P. S.

Trade Report.

Export prohibitions.

Great Britain. By an Order in Council, dated March 2nd, the exportation of paraffin wax and prussiate of soda is prohibited to all destinations other than British Possessions and Protectorates.

Germany. The exportation of collodion and of solutions of thorium and cerium salts is prohibited by a decree dated Feb. 15th.

Competition with Germany and Austria-Hungary. Board of Trade, March 5th and 10th, 1915.

IN connection with the campaign undertaken by the Board of Trade on the advice of their Advisory Committee on Commercial Intelligence to assist British manufacturers and merchants to secure trade formerly in the hands of German or Austro-Hungarian firms, the Board continue to receive a large number of inquiries for the names of sellers or buyers of articles of which the sources of supply or markets have been interfered with by the war. Special arrangements have been made in the Commercial Intelligence Branch of the Board of Trade for dealing with these inquiries, and lists 10 and 11 of articles which inquirers desire to purchase may be obtained by United Kingdom manufacturers and traders. British firms interested, as suppliers, in any of the goods mentioned should communicate with the Director of the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C. A recent list of goods which firms in this country are prepared to supply is also obtainable from the Commercial Intelligence Branch.

Export and import licences; War Trade Department for dealing with —. Board of Trade J., Feb. 25, 1915.

A DEPARTMENT under the Treasury (to be called the War Trade Department) has been formed to replace the Committee on Trade with the Enemy so far as concerns the work of dealing with applications for export and import licences. The Department will also embrace an Intelligence Division which will serve as a Clearing House for all war commercial information. All communications should be addressed to the Secretary of the Department at 4, Central Buildings, Westminster, S.W.

Books Received.

THE CHEMISTRY OF PETROLEUM AND ITS SUBSTITUTES. By C. K. Tinkler, D.Sc., and F. Challenger, Ph.D., B.Sc., Lecturers in Chemistry, Birmingham University, with an Introduction by Sir Boverton Redwood, Bart. Crosby, Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London, E.C. Price 10s. 6d. (336+16 pages, 8½×5½ in.)

THE appearance of this volume will be appreciated by many who have felt the need for a work containing a certain amount of technological matter, together with an outline of the purely chemical principles, of which a knowledge is essential to a comprehension of the methods of the petroleum industry. The earlier chapters deal with petroleum products and the manipulation of inflammable liquids generally, and include sections on shale distillation and the cracking process. Further chapters are added on coal tar and its products, hydrogenation, alcohol and its derivatives, wood distillation, saponifiable oils, and thermo-chemistry. Sir Boverton Redwood writes as follows in the introduction:—"The authors have aimed primarily at providing a text-book for students who desire to become proficient in the

chemical technology of petroleum, and they have admirably achieved their object. . . . The book is much more than a mere aggregation of facts, for it is a highly commendable and successful attempt to bridge over the gap between the academic and the practical treatment of the subject, and it should do much to pave the way to a better understanding of the intimate relations between pure and applied science, as well as of the extent to which the latter depends upon the former."

THE CHEMISTRY OF CYANOGEN COMPOUNDS AND THEIR MANUFACTURE AND ESTIMATION. By HERBERT E. WILLIAMS, J. and A. Churchill, London. 1915. Price 10s. 6d. iv.+423 pp.

THE scope and purpose of this book may be characterised by a quotation from the preface, in which the author says that, dissatisfied with the frequently incorrect and misleading statements about cyanogen compounds to be found in existing books, he has tried "to rescue the information scattered through the scientific press, to check the composition and properties of the compounds described as far as possible and to add a small quota to our knowledge of these compounds." The first half of the book is devoted to chemistry, the second half, in approximately equal parts, dealing with manufacture and analysis of cyanogen compounds. The substances described are:—Cyanogen, the cyanogen haloids, cyanamide and their derivatives; hydrocyanic, cyanic, cyanuric, fulminic, fulminuric, thio- and seleno-cyanic acids and the numerous simple and complex salts derived from them. The information to be found about each compound is, in most cases, confined to a statement of its empirical formula and brief directions for its preparation together with a qualitative statement of its solubility, colour, and appearance. Within these limits, it appears to be accurate and reliable, but it may be regretted that the author has not seen his way to carry through more thoroughly the first part of the programme outlined above. To mention a few examples taken at random, the solubilities of sodium and potassium ferrocyanides are not given, recent investigations of the composition of the ions of complex cyanides in solution are entirely neglected, the researches of Morrell and Burgen and of Grube and Krüger on the polymerisation of cyanamide and Walker's work on the formation of urea from ammonium cyanate are not referred to—the list of omissions might easily be extended. In reading an account of the bewilderingly numerous and apparently unrelated double and complex cyanides, the need of constitutional formulae is vividly felt, if only as an aid to memory; a systematic application of Werner's theory would have added to the interest of the book, and a freer use of ordinary constitutional formulae in dealing with the derivatives of cyanuric acid and cyanamide would have been helpful. The difficult question of the individuality of many of the amorphous ferrocyanides seems to the reviewer to merit more critical attention than the author has given it.

The portion of the book dealing with manufacture may be more unreservedly commended. The chapters dealing with the recovery of ferrocyanides from coal gas and with the manufacture of Prussian blue, in which the author appears to be writing largely from first-hand knowledge, are especially interesting. The same remarks apply to the analytical portion of the book, which should be very serviceable to anyone who has to take up this kind of work.

There is an unfortunately large number of misprints of proper names, especially in the second half of the book.

T. E.

